TR10-11 TECHNICAL REPORT:

Summer Institute on Climate Information for Public Health 2010

Gilma Mantilla, Michelle Stanton, Laurence Cibrelus

IRI Technical Report 2010
Summer Institute on Climate Information for Public Health

Summary of the Climate Information for Public Health Training Course

Palisades, New York

May 17- 28, 2010

Gilma Mantilla

Michelle Stanton

Laurence Cibrelus

International Research Institute for Climate and Society

The Earth Institute at Columbia University

Palisades, New York, 10964, US

Organized in partnership with

Mailman School of Public Health, Columbia University

Center for International Earth Science Information Network, Columbia University

Report available online at:

» http://iri.columbia.edu/publications/id=1011

With trainees' sponsorship by

Spanish Meteorological Office

Google.org

Center for Disease Control Uganda

Center for Disease Control Kenya

Deutsche Gesellschaft für Technische Zusammenarbeit Tunisia

Nigerian Meteorological Office

U.S. Agency for International Development Ethiopia

Malaria Research Institute India

National Oceanic and Atmospheric Organization's West Coast Center for Oceans and Human Health

Contents

Executive Summary

Now that the world's attention is focused on climate variability and climate change adaptation, it is essential, not only for public health communities, but also for planners in central government, to understand the role climate plays in driving disease burden and impacting economic growth. Public health emerges as the final common pathway for all impacts of climate variability and climate change on individuals as well as societies.

As a contribution to this process, The International Research Institute for Climate and Society (IRI), in partnership with the Center for International Earth Science Information Network (CIESIN) and the Mailman School of Public Health (MSPH) at Columbia University initiated this two-week course in 2008. Building on the response of our 2008 - 2009 alumni, and a great demand from the climate and health community the 2010 Summer Institute on Climate Information for Public Health (SI10) was designed to engage professionals who play a key role in the operational decision-making for climate-sensitive diseases in identifying and evaluating appropriate use of climate information. SI10 was held at Columbia University's Lamont-Doherty Campus in Palisades, New York, between May 17th and May 28th, 2010.

Participant selection

The IRI received 134 applications to SI10, spanning the globe, with Africa leading in number of application submissions. By region, 78 applications were received from Africa, 24 from Asia, 13 from Europe, 11 from North America, 7 from Latin America and the Caribbean, and 1 from the Southwest Pacific. Of the applications received, the majority of applicants reported holding positions of program management or directorship (22). Also well represented amongst applicants were members of academia, including graduate-level students (20) and professors of varying experience (16). Researchers and scientists followed (15), along with project officers (14), meteorologists (8), and others.

After removing applications that were incomplete or who demonstrated a lack of relevance to the course as currently set, applicants for SI10 were selected based on: (i) Funding ability, (ii) Strategic opportunity for engagement with key partner organization via an institutional support, and (iii) Personal characteristics, skills, grasp of the central issues expressed on the Statement of Interest, as well as ambitions. Candidates were ranked depending on the number and priority of criteria they met. At the end of the selection process, thirteen professionals from ten countries in the Americas, Asia and Africa were selected to participate in SI 10. Participants hailed from Ethiopia (4), Kenya (1), Uganda (1), Burkina Faso (1), Niger (1), Tunisia (1), India (1), China (1), Nigeria (1) and the United States (1). Three trainees worked in the climate or meteorological sector, and the remaining nine worked either in the public health sector or in health research fields. All trainees were key stakeholders in decision-making for health-care planning, evaluation or control of climate-sensitive diseases.

Course Overview

The course was designed to help participants (i) understand the role climate plays in driving the infectious disease burden and public health outcomes, (ii) use new tools for accessing climate and epidemiological data, for analyzing and mapping using the IRI Data Library and other Geographic information Systems (GIS) and (iii) understand management and data integration as an opportunity to improve the decision making process in public health.

The structure of the course provided a balance of concepts and methods from the health and climate communities using an approach deeply oriented toward methodology, gathering and using evidence for decision-making in order for the trainees to get in-depth knowledge and skills in decision-making for health-care planning of climate-sensitive diseases. The concepts presented during the morning lectures were reinforced by lunch seminars, the panel discussion, afternoon hands-on exercises using the on-line version of the IRI Data Library and Map Room, the daily quiz, the summaries of the key messages discussed on the previous day given by the trainees as well as the group discussion following the summary.

Thirty-two facilitators (including lecturers and organizers), supported by 13 information technology (IT), administrative, communication professionals and SI alumni, led the participants through the following modules: (i) Basic Concepts in Public Health and Climate, (ii) Sources and Tools for Analyzing Climate and Public Health Data and (iii) Use of Climate Information in Decision-Making for Climate-Sensitive Diseases. Additionally, a panel discussion involving international keynote speakers from the Centers for Disease Control and Prevention (CDC) and the United Kingdom Meteorological Office was hosted by the MSPH at the Medical Campus of Columbia University.

Throughout the course, trainees were assigned to develop a personal climate and public health project that would be relevant to their own institution and area of work. The trainees projects addressed issues as varied as "Temperature and Mortality in Beijing", "Relationship between rainfall and dengue in Delhi", "Typhoid Fever and Climate in Uganda: Is there a link?", "Relationships between climate and year-to-year variability in meningitis outbreaks: a case study in Burkina Faso and Niger" or "Malaria Risk Mapping in Oromia, Ethiopia". In order to offer the trainees the opportunity to share their learning experience with co-participants, facilitators, SI alumni and the Climate Information for Public Health (CIPH) network, these projects were presented on the last day of the course as posters, accompanied by a 300-word summary.

Several awards acknowledged the following outstanding performances: Best Poster, Excellence in Teaching, Involvement, active interaction and timeliness of a course facilitator during the pre course development, Best IT innovation, Best logistic support, and Originality in the development of the course curriculum.

The Climate Information for Public Health Action Network

The Climate Information for Public Health Action Network (CIPHAN) Web platform supported all course materials. As developed using the open-source Moodle[1] software, CIPHAN provides public health professionals with knowledge, methodologies, tools, and data to better manage climate sensitive diseases toward improving health outcomes. It acts as a web portal to guide the learner towards other sources of information, as well as a source of learning resources, such as educational modules and exercises. This site's library also contains a directory of published material to give the reader opportunity for further investigation. The CIPHAN Web-page also links to the IRI Data Library and Map Room.

During the course, trainees were also introduced to the contribution they are strongly encouraged to have within the CIPH Alumni Network and the Climate Information for Public Health Action (CIPHA) Newsletter, which provides updates on the latest developments within the CIPH network, including the activities of alumni and facilitators, brief meeting reports, news from the health and climate community, and opportunities for collaboration.

1 Moodle is a Course Management System, also known as a Learning Management System or a Virtual Learning Environment. It is a free Web application that educators can use to create effective online learning sites. Adapted from: http://moodle.org/

Course Evaluation

The course evaluation process was designed to highlight any gaps in the contents and delivery of the course material, and further to provide the organizers with an insight into how changes in the course since SI 09 were received. Overall, the evaluation indicated that the trainees found the training to be very valuable, and provided them with knowledge that could be incorporated into their future work. Trainees were impressed with the commitment of the facilitators, organizers and support staff who were involved in SI 10, and equally the facilitators enjoyed engaging with the trainees and sharing in their enthusiasm towards combining the climate and health communities.

In addition to praise for the training course, the evaluation process also highlighted areas where the training could be improved. During the course the trainees were encouraged to apply the practical skills they were learning to their own data. The trainees had a great deal of praise for this learning technique, however were a little frustrated that the scheduling of the course didn't allow them to immerse themselves in this task as much as they would've liked. Further, a common recommendation made by the course facilitators and organizers was that the contents of the course be scaled back in order to focus more on the practical aspects of the training.

Trainees Financial Support

Financial support to the course trainees was provided by the Spanish Meteorological Service (AEMET), Google.org, CDC Uganda, CDC Kenya, Gesellschaft für Technische Zusammenarbeit (GTZ) Tunisia, the Nigeria Meteorological Office, USAID Ethiopia, the Malaria Research Institute of India and the National Oceanic and Atmospheric Administration (NOAA)'s West Coast Center for Oceans and Human Health.

"... The structure of the training course is excellent: comprehensive in scope; good teachers; adequate learning materials and methods. It should yield excellent results after the two week period of training"

Ulisses Confalonieri, member of the IRI's International Scientific and Technical Advisory Committee and SI facilitator

"The hands-on experience we got in the practical sessions exceeded my expectations"

SI 10 trainee

"Exposure to the Data Library with hands-on experience and availability of internationally renowned expertise in all aspects of climate and health at the Summer Institute is the uniqueness of the course"

SI 10 trainee

"The faculty, facilitators and organizers of the course deserve commendation"

SI 10 trainee

"By the way of the Summer Institute, I was able to expose [to new concepts] people who can shape a whole weather service, who can contact a public health service in their country and make a big difference"

SI 08 trainee

Participants and Facilitators of SI 10. Francesco Fiondella/IRI

Acronyms

AFRO-WHO	World Health Organization Regional Office for Africa
AMS	American Meteorological Society
CDC	Centers for Disease Control and Prevention
CHWG	Climate and Health Working Group
CIESIN	Center for International Earth Science Information Network
CIPH	Climate Information for Public Health
CIPHA	Climate Information for Public Health Action, newsletter
CIPHAN	Climate Information for Public Health Action Network
CPT	Climate Predictability Tool
CRED	Center for Research on Environmental Decision Making
CRM	Climate Risk Management
ENSO	El Niño-Southern Oscillation
EPA	U.S. Environmental Protection Agency
EWS	Early Warning System
FETP	Field Epidemiology Training Program
GIS	Geographic Information System
GPS	Geographic Position System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IPCC	Intergovernmental Panel on Climate Change
IRI	International Research Institute for Climate and Society
IT	Information Technology
LSHTM	London School of Hygiene and Tropical Medicine
MDG	Millennium Development Goal
MERIT	Meningitis Environmental Risk Information Technologies
MEWS	Malaria Early Warning System
MCQ	Multiple Choice Questions
MoH	Ministry of Health
MSPH	Mailman School of Public Health
NOAA	National Oceanic and Atmospheric Administration
NGO	Non Governmental Organization
NRDC	Natural Resources Defense Council
PAHO-WHO	Pan-American Health Organization - World Health Organization
Q&A	Questions and Answers
SI	Summer Institute on Climate Information for Public Health
UK	United Kingdom
USAID	United States Agency for International Development
WHO	World Health Organization
WMO	World Meteorological Organization

Acknowledgements

The organizers of SI10 and the authors of this report would like to acknowledge the following persons for the truly dedicated support during SI10:

Scott Wood, from the Climate and Society Master Program at Columbia University, for carefully helping on building up the SI10 documentation before course begun and for setting up the application report.

Jason Rodriguez, from the IRI, for designing the document.

And all the trainees' sponsors, facilitators, support staff and trainees of SI10 for contributing to the success of the course:

Sponsor

Spanish Meteorological Office (AEMET)

Google.org

CDC Uganda

CDC Kenya

GTZ Tunisia

Nigerian Meteorological Office

USAID Ethiopia

Malaria Research Institute India

NOAA's West Coast Center for Oceans and Human Health

Support Staff

Baaba Baiden, IRI

Ann Binder, IRI

Jessie Carr, MSPH

Michael Dervin, IRI

Francesco Fiondella, IRI

Rise Fullon, IRI

Saleh Ghani, CIESIN

Chihuei Lu, IRI

Luciana Mendiola, Climate and Society Program, Columbia University

Althea Murillo, IRI

Barbara Platzer, IRI

Jason Rodriguez, IRI

Kelli Stewart, LDEO

Jeffrey Turmelle, IRI

Cathy Vaughan Green, IRI

Sandy Vitelli, IRI

Scott Wood, Climate and Society Program, Columbia University.

Facilitators

Walter Baethgen, IRI
Tony Barston, IRI
Eric Bertherat, WHO
Mark Becker, CIESIN
Michael Bell, IRI
Menno Bouma, LSHTM
Pietro Ceccato, IRI
Ulisses Confalonieri, Oswaldo Cruz Foundation
Laurence Cibrelus, IRI
Stephen Connor, IRI
Remi Cousin, IRI
Ashley Curtis, IRI
John del Corral, IRI
Peter Diggle, Lancaster School of Health and Medicine
Dia El Naiem, University of Maryland
Wayne Elliot, UK Meteorological Office
Francesco Fiondella, IRI
Patricia Graves, the Carter Center
Patrick Kinney, MSPH
Kim Knowlton, MSPH and NRDC
Richard Luce, CDC
Bradfield Lyon, IRI
Stephen Morse, MSPH and USAID
Ousmane Ndiaye, IRI
Gilma Mantilla, IRI
Sabine Marx, CRED
Simon Mason, IRI
Judy Omumbo, IRI
Carlos Perez, IRI
Andrew Robertson, IRI
Sabine Marx, CRED
Simon Mason, IRI
Judy Omumbo, IRI
Carlos Perez, IRI
Andrew Robertson, IRI
Daniel Ruiz, IRI
Wendy Marie Thomas, AMS
Madeleine Thomson, IRI
Sylwia Trzaska, IRI
Pascal Yaka, Burkina Faso Meteorological Office
Steve Zebiak, IRI.

Trainees

Betty Abang, CDC, Office of Uganda
Wakgari Amente, Addis Ababa University
Yilma Bekele, Addis Ababa University
Ali Bouattour, Tunisia Pasteur Institute
Ramesh Chand Dhiman, Indian Council of Medical Research
Abenet Girma Dessalegn, CHWG of Ethiopia
Stephanie Kay Moore, NOAA
Tiantian Li, CDC of China
Ayub Shisia Manya, Ministry of Health and Sanitation of Kenya
Mouhaimouni Moussa, Niger Meteorological Office
Hiwot Namaga, USAID, Office of Ethiopia
Andrew Oniarah, Nigeria Meteorological Office
Pascal Yaka, Burkina Faso Meteorological Office.

Team Members

Organizers

Gilma Mantilla, Laurence Cibrelus and Madeleine Thomson, from the IRI, Mark Becker, from CIESIN and Patrick Kinney, from the MSPH, were responsible for the organization of SI10.

Development of the course agenda and training materials

The team was led by Laurence Cibrelus, from the IRI. Gilma Mantilla, also from the IRI, oversaw the development of the agenda and the training materials.

Logistic team

The following persons led the logistics of SI 10: Ann Binder, Francesco Fiondella, Mike Dervin, Baaba Baiden, Jeffrey Turmelle, Althea Murillo, Jason Rodriguez and Sandy Vitelli, from the IRI. Jessie Carr from MSPH and Luciana Mendiola from the Climate and Society Master Program also supported SI10 and the MSPH panel discussion.

Evaluation group

The following persons were responsible for developing and overseeing the course evaluation: SI 08 alumna Michelle Stanton from the Lancaster School of Medicine, Gilma Mantilla and Laurence Cibrelus, from the IRI.

Poster Prize Committee

The following team evaluated the posters of the SI10 trainees and attributed the Best Poster Prize: Mark Becker, CIESIN, Ann Binder, IRI, Carolyn Mutter, IRI, Andrew Robertson, IRI and Wendy Marie Thomas, AMS.

Authors of this report

Gilma Mantilla was the general coordinator of SI10.

Michelle Stanton was a SI10 facilitator conducted the course evaluation.

Laurence Cibrelus was a SI10 facilitator and conducted the development of the course curriculum.

Detailed biographies of the facilitators and support staff are available in a separate appendix.

Introduction

The International Research Institute for Climate and Society (IRI)/Earth Institute at Columbia University is the premier global research and capacity building institution focused on the use of climate information in public health, agriculture and water decision-making. IRI is a collaborating center with WHO-PAHO on climate sensitive diseases and has active international partnerships concerning malaria, meningococcal meningitis, Rift Valley Fever and other diseases. IRI's areas of interest also include dengue, diarrheal diseases, Kala-azar (leishmaniasis) and conditions associated with flood, drought and disasters.

The mission of the IRI is to enhance society's capability to understand, anticipate and manage the impacts of climate in order to improve human welfare and the environment, especially in developing countries. The IRI conducts this mission through strategic and applied research, education, capacity building, and by providing forecasts and information products with an emphasis on practical and verifiable utility and partnership.

- In particular, the public health commitment of the IRI involves developing, with partners, a knowledge system based on three main components:
- Understanding the community of practice, identifying the needs, and collaborating with Ministries of Health to work at the local to regional levels;
- Developing tools to monitor, survey and predict disease epidemics based on climate data, patterns and trends
- Building capacity through the education and training of public health professionals on the relationship between climate and health.

The IRI is committed to converting knowledge gained into training and education products which are then communicated in person and in electronic media to expand the basis for learning about climate risks and introducing concepts into a decision making process of different sectors. The Summer Institute on Climate Information (SI) was created in 2008 to meet this need and achieve the Public Health goals of the IRI, in partnership with the Columbia University Center for International Earth Science Information Network (CIESIN) and Mailman School of Public Health (MSPH).

This report summarizes Summer Institute 2010 on Climate Information for Public Health (SI10). It describes the content and the evaluation of the course with summaries of each training module. It also introduces the participants – organizers, trainees, lecturers and facilitators – who contributed to the success of SI 10.

Participants

Selection Process

The IRI received 134 applications for this year's Climate Information for Public Health Action Summer Institute. Applicants spanned the globe, with the continent of Africa leading in number of application submissions. By region, 78 applications were received from Africa, 24 from Asia, 13 from Europe, 11 from North America, 7 from Latin America and the Caribbean, and 1 from the Southwest Pacific. Of the applications received, the majority of applicants reported holding positions of program management or directorship (22). Also well represented amongst applicants were members of academia, including graduate-level students (20) and professors of varying experience (16). Researchers and scientists followed (15), along with project officers (14), meteorologists (8), and others.

Applicants for the 2010 Summer Institute were selected based on a range of criteria. In order to facilitate the selection process of the pool of 134 applicants, an initial shortlist was compiled which appropriately narrowed down the pool of potential candidates. This was accomplished by removing applicants who did not submit a complete application on line, had previously been trained, and who demonstrated a lack of relevance to the course as currently set (e.g., lawyers or volunteers). Following the development of the short list, the following criteria were applied to each of the remaining candidates.

Criteria Applied to Each Candidate

Criteria	Criteria Description
1	Funding: Self-funding is highly recommended
2	Strategic opportunity for engagement with key partner organization via an institutionally supported individual
3	Personal characteristics, skills, grasp of the central issues expressed on the Statement of Interest, and ambitions

Candidates were then ranked and selected according to the following method (1 = Highest Priority, 4 = Lowest Priority).
Criteria Applied to Rank the Candidates

Priority Rating	Criteria Required
1	Meets all three criteria
2	Meets criteria 1 and 2 or 3
3	Meets criteria 2 and 3
4	Meets one of the criteria listed

The full application report is available from a separate appendix.

Accepted Trainees

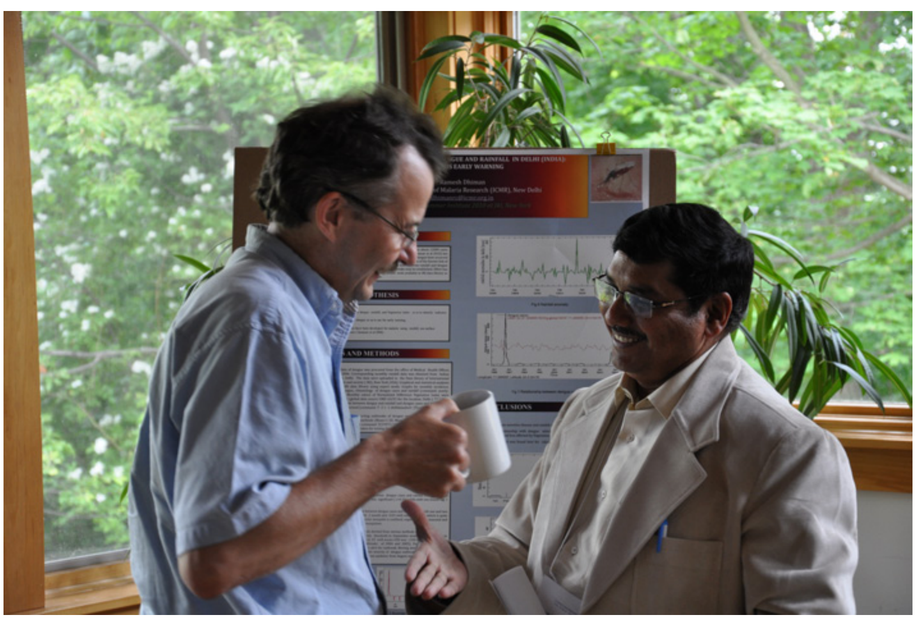
At the end of the selection process, thirteen professionals from ten countries in the Americas, Asia and Africa were selected out of the 134 applicants to participate in SI10.

Participants hailed from Ethiopia (4), Kenya (1), Uganda (1), Burkina Faso (1), Niger (1), Tunisia (1), India (1), China (1), Nigeria (1) and the United States (1). Three trainees worked in the climate or meteorological sector, and the remaining nine worked either in the public health sector or in health research fields. All trainees were professionals who play a key role in decision-making for health-care planning, evaluation or control of climate-sensitive diseases.

The organizers of the course were very much honored to welcome the following professionals to SI10: Betty Abang from the CDC, Office of Uganda, Wakgari Amente from Addis Ababa University, Yilma Bekele from Addis Ababa University, Ali Bouattour from the Tunisia Pasteur Institute, Ramesh Chand Dhiman from the Indian Council of Medical Research, Abenet Girma Dessalegn from the CHWG of Ethiopia, Stephanie Kay Moore from NOAA, Tiantian Li, from the CDC of China, Ayub Shisia Manya from the Ministry of Health and Sanitation of Kenya, Mouhaimouni Moussa from the Niger Meteorological Office, Hiwot Namaga from the USAID Office of Ethiopia, Andrew Oniarah from the Nigeria Meteorological Office, and Pascal Yaka from the Burkina Faso Meteorological Office.

Detailed biographies of the SI10 trainees are provided in a separate appendix.

The CIPHAN Web-page, the CIPHA Newsletter and the CIPH Alumni Network



SI10 Facilitator Brad Lyon, IRI, and SI10 Participant Ramesh Chand Dhiman, National Institute of Malaria Research at the Indian Council of Medical Research, interact during the poster session. Francesco/IRI

For the first time since the implementation of the Summer Institute, the Climate Information for Public Health Action Network (CIPHAN) Web platform supported all course materials. Trainees were also introduced to their expected role within the CIPH Alumni Network and the Climate Information for Public Health Action (CIPHA) Newsletter.

A lot of knowledge remains indeed to be built in the area of climate and public health and the field efficiency of the new approaches implemented is yet to be assessed. For these reasons, it is critical that networking and interaction platforms allowing climate and public health professionals to communicate and share their knowledge and experience exist.

The CIPHAN platform was developed to respond to this need. It provides public health professionals with knowledge, methodologies, tools, and data to better manage climate sensitive diseases toward improving health outcomes. CIPHAN acts as a web portal to guide the learner towards other sources of information, as well as a source of learning resources, such as educational modules and exercises. This site's library also contains a directory of published material to give the reader opportunity for further investigation.

Front page of the CIPHAN Web-platform.

Similarly the CIPHA Newsletter was created to provide updates on the latest developments within the CIPH network, including the activities of alumni and facilitators, brief meeting reports, news from the health and climate community, and opportunities for collaboration.

Trainees from SI10, as well as from the previous summer institutes and in-country CIPH trainings, are expected to contribute to development and sustainability of these platforms and associated CIPH projects.

Course Overview

Week one: May 17-21, 2010

	Mon, 17-May	Tues, 18-May	Wed, 19-May	Thr, 20-May	Fri, 21-May
Module	***Basic Concepts in Public Health and Climate***	***Basic Concepts in Public Health and Climate***	***Sources and Tools for Analyzing Climate and Public Health Data***	***Sources and Tools for Analyzing Climate and Public Health Data***	***Sources and Tools for Analyzing Climate and Public Health Data***
Morning 9:00am-12:30pm	***9:00-9:15am*** Welcome *Stephen Zebiak* ***9:15-9:30am*** Introduction to Summer Institute 2010 and to the CIPHA Network *Madeleine Thomson, Patrick Kinney, Mark Becker*	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day
	9:30-9:45am Overview of the Course *Gilma Mantilla* ***9:45-10:15am*** Introduction of the Participants and Facilitators Selection of the Rapporteur for the next day *Madeleine Thomson*	***9:30-10:30am*** Introduction to Climate and Climate Information *Sylwia Trzaska*	***9:30-10:15am*** Climate and Vector-Borne Disease Dynamics *Madeleine Thomson*	***9:30-10:15am*** Remote Sensing as a Tool to Manage Environmental Data *Pietro Ceccato*	***9:30-10:30am,*** Field Practice Using GPS, GIS and Google Maps for Public Health ***Part I*** *Mark Becker*
	10:15-10:30am ***Coffee Break*** ***10:30-11:15am*** Climate Risk Management and Development *Walter Baethgen*	***10:30-10:45am*** ***Coffee Break*** ***11:00-11:45am*** Core Concepts in Public Health and Epidemiology *Judy Omumbo*	***10:15-10:30am*** ***Coffee Break*** ***10:30-11:00am,*** CIESIN Lab Malaria Vector Distribution and Rainfall *Judy Omumbo*	***10:15-11:00am*** Introduction to Cluster Analysis *Andy Robertson*	***10:30-10:45am*** ***Coffee Break*** ***10:45-11:45am,*** Field Practice Using GPS, GIS and Google Maps for Public Health ***Part II*** *Mark Becker*
	11:15-12:00pm Climate, Vulnerability and Health: International and National perspectives *Ulisses Confalonieri*		***11:00-12:00pm,*** ***CIESIN Lab*** Exploratory Time Series Analysis *Andy Robertson*	***11:00-12:00pm,*** ***Monell Auditorium*** Special Climate Briefing *Tony Barston* ***-- coffee break will be served at the Monell Auditorium --***	***11:45-12:30pm*** Meningitis Environmental Risk Information Technology (MERIT) *Madeleine Thomson*
	12:00-12:30pm Climate Risk Management in Health *Madeleine Thomson*	***11:45-12:30pm*** Public Health Surveillance and Opportunities to use Climate Information *Richard Luce*	***12:00-12:30pm,*** CIESIN Lab Malaria Mapping and the Climate Suitability for Malaria Transmission Tool in the Health Map Room *Judy Omumbo, Remi Cousin*		

Week one: May 17-21, 2010

	Mon, 17-May	Tues, 18-May	Wed, 19-May	Thr, 20-May	Fri, 21-May
Lunch 12:30-2:00pm	***Welcome Lunch***	***Lunchtime seminar History of Climate and Malaria - Does Causality Matter?*** *Menno Bouma*		***Lunch-time seminar Infectious Diseases and Climate: Influenza Seasonality and Early Warning*** *Stephen Morse*	***Nature Walk Cathy Vaughan, Ashley Curtis***
Afternoon 2:00-5:30pm CIESIN Lab	***2pm-3:30pm*** Overview of the IRI Data Library *Michael Bell*	***2:00-4:00pm*** Summarizing climate and health data using descriptive statistics and map tools *Michael Bell*	***2:00-3:00pm*** Open practice with the Data-Library using participants' datasets	***2:00-3:00pm*** Remote Sensing Tools in the Health Map Room ***Part I*** *Pietro Ceccato*	***2:00-3:00pm*** Lagged Correlation of Rainfall with Malaria Incidence *Michael Bell*
	3:30-3:45pm ***Coffee Break***	***4:00-4:15pm*** ***Coffee Break***	***3:00-4:00pm*** ***Transfer to the Mailman School of Public Health***	***3:30-3:45pm*** ***Coffee Break***	***3:00-3:15pm*** ***Coffee Break***
	3:45-5:15pm Understanding Data and Data Quality Control *John del Corral, Michael Bell, Remi Cousin*	***4:15-5:00pm*** Applications using the Participants' Datasets *John del Corral, Michael Bell, Remi Cousin*	***4:00-6:00pm*** ***Mailman School of Public Health Panel Discussion:*** Creating a "Climate Smart" Global Health Community: How do we Communicate? Who do we Train? Opening Speech: ***Dean Linda Fried, Mailman School of Public Health*** ***Facilitator:*** *Madeleine Thomson, IRI* ***Panelists:*** • *Elliot Wayne, Met Office UK* • *Richard Luce, CDC/ Field Epidemiology Training Programs. Resident Advisor Ethiopia* • *Patrick Kinney, Mailman School of Public Health*	***3:35-4:45pm*** Remote Sensing Tools in the Health Map Room ***Part II*** *Pietro Ceccato*	***3:15-4:45pm*** K-Means Cluster Analysis Exercise: Malaria Seasonality *Pietro Ceccato*
		5:00-5:15pm Open space for practice with the Data-Library or meetings with facilitators		***4:45-5:15pm*** Open space for practice with the Data-Library or meetings with facilitators	***4:45-5:15pm*** Open space for practice with the Data-Library or meetings with facilitators
	5:15-5:30pm Daily Evaluation of the Course	***5:15-5:30pm*** Daily Evaluation of the Course		***5:15-5:30pm*** Daily Evaluation of the Course	***5:15-5:30pm*** Daily Evaluation of the Course
Evening			Reception at the Mailman School of Public Health	Palisades Mall Tour	

Week Two: May 24-28, 2010

	Mon, 24-May	Tue, 25-May	Wed, 26-May	Thr, 27-May	Fri, 28-May
Module	***Use of Climate Information in Decision-Making for Climate-Sensitive Diseases***	***Use of Climate Information in Decision-Making for Climate-Sensitive Diseases***	***Use of Climate Information in Decision-Making for Climate-Sensitive Diseases***	***Use of Climate Information in Decision-Making for Climate-Sensitive Diseases***	***Use of Climate Information in Decision-Making for Climate-Sensitive Diseases***
Morning 9:00am-12:30pm	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day	***9:00-9:30am*** 10min Quiz 20 min Summary of the Previous Day by a Participant, followed by Open Discussion with the Lecturers Selection of the Rapporteur for the Next Day
	9:30-10:45am Understanding Predictions and Projections in Climate *Sylwia Trzaska*	***9:30-10:30am*** Climate Change, War and Disease *Dia El Naiem*	***9:30-10:15am*** Temperature Trends in the Highlands of East Africa *Bradfield Lyon*	***9:30-10:15am*** Climate Change and Human Health: Current Impacts and Future Risks *Patrick Kinney*	***9:30-10:15am*** Open space to work on projects ***Part I***
	10:45-11:00am ***Coffee Break***	***10:30-10:45am*** ***Coffee Break***	***10:15-10:30am*** ***Coffee Break***	***10:15-10:30am*** ***Coffee Break***	***10:15-10:30am*** ***Coffee Break***
	11:00-11:45am Building Sustainable Partnerships to Improve Meningitis Surveillance and Response: the MERIT Initiative	***10:45-11:30am*** Malaria Early Warning and Early Response *Stephen Connor*	***10:30-11:15am*** Linking ENSO and Society *Tony Barston*	***10:30-11:15am*** Heat Waves in the USA from the Climate Perspective *Bradfield Lyon*	***10:30-12:00pm*** Open space to work on projects ***Part II***
	11:45-12:30pm Spatio-Temporal Modeling of Meningitis *Peter Diggle*	***11:30-12:30pm*** Integrated Surveillance and Control System for Malaria in Colombia *Daniel Ruiz*	***11:15-12:30pm*** Climate Change and Vulnerability *Carlos Perez*	***11:15-12:00pm*** Heat Waves and Public Health: a USA Case Study *Kim Knowlton* ***12:00-12:30pm*** Group Discussion on Heat Waves	

Week Two: May 24-28, 2010

	Mon, 24-May	Tue, 25-May	Wed, 26-May	Thr, 27-May	Fri, 28-May
Lunch 12:30-2:00pm	***Lunch break***	***Celebrity Walk Barbara Platzer***	***Lunch break***	***Lunch break***	***Lunch break***
Afternoon 2:00-5:30pm CEISIN Lab	***2:00-3:30pm*** Using GIS to Exploring the Links between Poverty and Natural Hazards ***Part I*** *Mark Becker*	***2:00-3:30pm*** Epidemic Detection and Monitoring using Thresholds ***Part I*** *Patricia Graves*	***2:00-4:00pm*** Climate Prediction for Weather Forecast Skeptics *Simon Mason*	***2:00-3:30pm*** Open space for practice with the Data-Library or work on projects Part I	***2:00-3:00pm,*** Monell Lower Lobby Presentation of participants' projects ***Part I***
	3:30-3:45pm ***Coffee Break***	***3:30-3:45pm*** ***Coffee Break***	***4:00-4:15pm*** ***Coffee Break***	***3:30-3:45pm*** ***Coffee Break***	***3:00-3:15pm*** ***Coffee Break***
	3:45-5:15pm Using GIS to Exploring the Links between Poverty and Natural Hazards ***Part II*** *Mark Becker*	***3:45-4:45pm*** Epidemic Detection and Monitoring using Thresholds ***Part II*** *Patricia Graves* ***4:45-5:15pm*** Open space for practice with the Data-Library or meetings with facilitators	***4:15-5:15pm*** How to Use Maps as a Tool to Communicate Climate Risk *Sabine Marx, Francesco Fiondella*	***3:45-5:15pm*** Open space for practice with the Data-Library or meetings with facilitators ***Part II*** ***And/or*** ***4:00-5:00pm*** Poster Clinic *Francesco Fiondella, Jason Rodriguez*	***3:15-4:15pm,*** Monell Lower Lobby Presentation of participants' projects ***Part II*** ***4:15-4:30pm,*** Monell Auditorium Graduation and Award Ceremony
	5:15-5:30pm Daily evaluation of the course	***5:15-5:30pm*** Daily evaluation of the course	***5:15-5:30pm*** Daily evaluation of the course	***5:15-5:30pm*** Daily evaluation of the course	***4:30-5:00pm*** Daily and Final Evaluation of the Course
Evening			***5:30-7:30pm,*** Lamont Hall Weather Roulette: How to Make Decisions Given Probabilistic Forecasts *Simon Mason, Ashley Curtis*	***Farewell Party, Lamont Hall***	***Closing***

Learning Goals by Module

Module I: Basic Concepts in Public Health and Climate (Days 1, 2)

To equip trainees to (i) introduce the concept of Climate Risk Management and to promote discussion on how to incorporate it in the participants' activities in the health sector; (ii) understand how climate, in various temporal and spatial scales, drives the transmission of many diseases and, in particular, the role of climate in driving the transmission of vector-borne diseases, meningitis and cardio respiratory diseases; (iii) Understand how climate may impact public health, in particular through increased hazards and vulnerability, resulting in increased risk; (iv) understand the terms: weather versus climate, climatology, climate variability versus climate change, climate anomalies, and climate data versus climate information (forecast products, monitoring products); (v) understand routine epidemiological measurements and their spatial and temporal resolution in the framework of Public Health Surveillance; and (v) understand the capabilities of the IRI Data Library and how it may be applied as a useful tool for analyzing climate and health data.

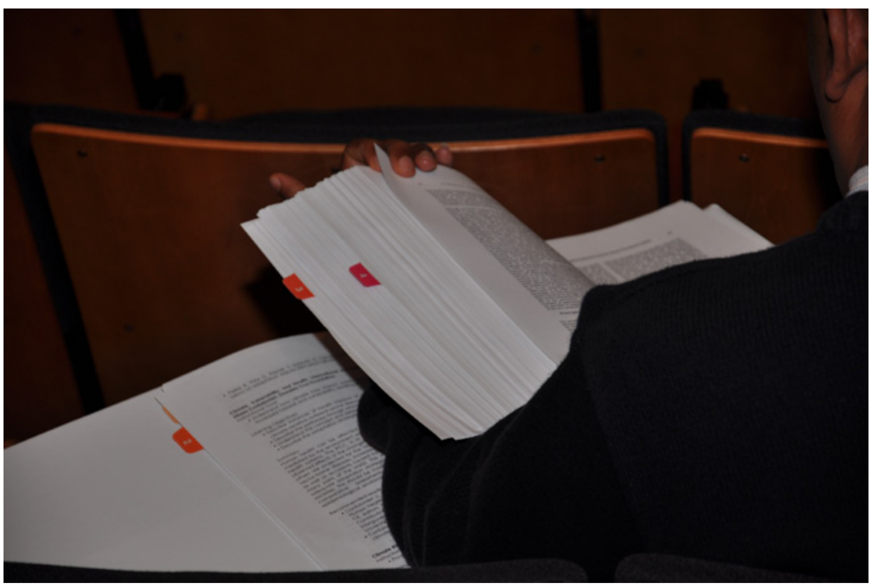
Module II: Sources and Tools for Analyzing Climate and Public Health Data (Days 3, 4, 5)

To equip trainees to (i) understand time scales and spatial resolution, the benefits and limitations of different climate, health and environmental data sources including remotely sensed data, meteorological data, climate predictions and epidemiological data; (ii) use new tools for accessing climate and epidemiological data, for analysis and mapping through the IRI Data Library, Geographical Information Systems , Google Earth and Excel spreadsheet tools; (iii) select the appropriate type of health data required for different health/climate analyses; (iv) introduce basic concepts of the dynamics climatic drivers of transmission of vector-borne diseases; (v) define, interpret and understand when to use different statistical methods; and (vi) understand the power of maps to display data and as a tool for decision making in Public Health.

Module III: Use of Climate Information in Decision-making for Climate-Sensitive Diseases (Days 6, 7, 8, 9, 10)

To equip trainees to (i) understand the rationale behind different types of predictions and projections with an emphasis on the interpretation and limitations of the available predictive methods; (ii) show how sophisticated statistical modeling ideas can contribute to the solution of real-world public health problems;(iii) understand why climate information needs to be coupled with health information to inform public health decisions; (iv)understand how researchers can help decision makers to understand the sources of uncertainty in forecasts and predictions and what might be done to reduce it; (v) understand the concepts and methods pertaining to vulnerability analysis and adaptation to climate change;(vi)understand how an ENSO-modified seasonal climate can affect society; (viii) demonstrate how to analyze, create and replicate the simulation outputs of several malaria dynamical models using a case study from Colombia. ; and (viii) explore scenario-based integrated risk assessment for climate change and heat-related health impacts

Details on the daily lectures, practical sessions and associated readings per module are provided on the following page



Materials from the SI10 participant package. Francesco/IRI

Sessions Summaries by Module

Module I: Basic Concepts in Public Health and Climate (Days 1, 2)

Day 1: Monday, May 17, 2010

Introduction to the Summer Institute 2010 and to the CIPHAN network, by Madeleine Thomson, IRI

Summary:

In 2008 and 2009 Summer Institutes on Climate Information for Public Health (CIPH) were conducted at the Lamont Doherty Campus to engage professionals from around the world who play a key role in the operational decision-making for climate-sensitive diseases in identifying and evaluating appropriate use of climate information. The CIPH Summer Institute 2010 builds on this experience and that of our partners and alumni who have been testing the tools, methodologies and approach developed in their own institutions.

Recommended reading:

Cibrelus L, Mantilla G. Executive Summary. In: Summary of the Climate Information for Public Health Training Course. Palisades, NY: International Research Institute for Climate and Society at the Earth Institute, Columbia University; 2009. p. 1-5. Available from:

» http://portal.iri.columbia.edu/portal/server.pt/gateway/PTARGS_0_2_4700_0_0_18/SI2009_Summary_web.pdf

Overview of the Course, by Gilma C. Mantilla, IRI

Summary:

The 2010 Summer Institute course on '*Climate Information for Public Health*' is a two-week training course that offers public health decision makers the opportunity to learn practical methods and tools for integrating climate knowledge into decision-making processes. The course was designed to have three modules : one on basic concepts of climate and public health, the second : Sources and Tools to Analyze Climate and Public Health Data and the last one on the Use of Climate Information in Decision-making for Climate-sensitive Diseases. It also has an evaluation system that relied on on-line open-ended and numeric questions addressing the design and delivery of the course, as well as the opportunities that could arise from the course. The expected benefits of the course will be that the participants could use the knowledge and skills gained during the Summer Institute to train their peers in their own institution and country.

Recommended reading:

Visit the Web-page of the Climate Information for Public Health Action Network (CIPHAN) at:

» http://ciphan.iri.columbia.edu/

Climate Risk Management and Development, by Walter E. Baethgen, IRI

Summary:

Introducing and improving climate risk management in the health sector requires full cooperation of climate scientists, climate information providers and agents acting at different levels of the health sector. Such cooperation must be oriented to establish interdisciplinary activities that create climate products, information and tools that effectively inform planning and decision making in the health sector. Adequate interaction between these communities enhances knowledge exchange, ensures adequate identification of problems/demands, and helps to tailor climate related information and products that effectively assist the health community. The history of the first 15 years of the IRI has taught valuable lessons on the balance needed to maintain scientific excellence and ensure socioeconomic relevance.

Recommended readings:

Baethgen WE. Climate Risk Management for Adaptation to Climate Variability and Change. Crop Science 2010;50(Supplement 1).

Pielke R, Prins G, Rayner S, Sarewitz D. Climate change 2007: lifting the taboo on adaptation. Nature 2007;445(7128):597.

Climate, Vulnerability, and Health: International and National Perspectives, by Ulisses Confalonieri, Oswaldo Cruz Foundation

Summary:

Human health can be affected by global climate change in several ways, mediated by the environment and the social characteristics, which includes the health systems. The IPCC, in its Fourth Assessment Report, has identified a few observed effects of the changed climate on health, mostly in Europe, but several others are projected for the next decades, such as the spatial redistribution of vector-borne diseases, increase in under nutrition, diarrhea in tropical countries as well as accidents caused by weather extremes and respiratory ailments an many parts of the world. The major task for the health sector is to develop adequate adaptation strategies, which means to reduce the vulnerability of societies. This should be made by public policies oriented by quantitative and comparative assessments of vulnerability that take into account epidemiological, environmental, social and climatic information.

Recommended readings:

Confalonieri U, Menne B, Akhtar R, Ebi KL, Hauengue M, Kovats RS, et al. Human health. In: Parry ML, Canziani OF, Palutikof JP, Linden PJvd, Hanson CE, editors. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press; 2007. p. 391-431.

Confalonieri UEC, Marinho DP, Rodriguez RE. Public health vulnerability to climate change in Brazil. Clim Res 2009;40:175-186.

Climate Risk Management in Health, by Madeleine Thomson, IRI

Summary:

During the past decade, the global health community has advocated for, planned and began resourcing global health initiatives focused on the needs of the poor - as indicated by the United Nations Declaration on the Millennium Development Goals (MDGs). The arrival of climate change on the global health centre stage, was marked by the address on climate change and global public health in November 2007 by Margaret Chan Director-General of the World Health organization (WHO) - "Climate change will affect, in profoundly adverse ways, some of the most fundamental determinants of health: food, air, water."

As societies in general and the health community in particular, start to adapt to climate change, will this new agenda detract from, or support the pro-poor global health agenda that has been so long in the making? Climate knowledge and information can form a bridge between these two agendas - managing the climate related risks of today while improving our understanding of the risks of tomorrow.

Recommended readings:

Campbell-Lendrum D, Bertollini R, Neira M, Ebi K, McMichael A. Health and climate change: a roadmap for applied research. The Lancet 2009;373(9676):1663-1665.

Connor S, Omumbo J, Green C, DaSilva J, Mantilla G, Delacollette C, et al. WS-1 Climate and human health: Health and Climate - Needs. In: World Climate Conference 3; 2009; Geneva, Switzerland; 2009 (in press).

Kelly-Hope L, Thomson MC. Climate and infectious diseases. In: Thomson MC, Garcia Herrera R, Beniston M, editors. Seasonal Forecasts, Climatic Change and Human Health: Springer Netherlands; 2008. p. 31-70.

Overview of the Data Library, by Michael Bell, IRI

Summary:

The IRI Data Library is a powerful online resource for accessing, analyzing, visualizing, and downloading climate-related data sets. It is capable of relating different types of data sets (e.g. gridded data, station data, geographic shapes) in a common data model such that relationships between gridded climate data and health data collected by geographic region, for example, can be analyzed. Specialized map and analysis tools in the IRI Map Rooms have been developed using Data Library functionality to meet specific needs in the health community and other sectors. This session provides an introduction to the IRI Data Library.

Recommended reading:

The IRI Data Library: A Tutorial

» http://iridl.ldeo.columbia.edu/dochelp/Tutorial/

Understanding Data and Data Quality Control, by John del Corral, IRI

Summary:

Precisely describing the time and locale of the data is a major step in the data analysis process. This is particularly true in the instance of geo-referenced climate and health data, that we want to analyze temporally and spatially. Ensuring good data quality includes: 1) ensuring self-consistency, 2) ensuring geographical consistency, and 3) providing with useful and useable metadata. Although this process may appear as quite demanding and time-consuming, it shall not be neglected because it: 1) simplifies subsequent analysis, 2) allows more sophisticated functions to be applied, and 3) allows ready comparison with other datasets.

Day 2: Tuesday, May 18, 2010

Introduction to Climate and Climate Information, by Sylwia Trzaska, IRI

Summary:

One of the main issues of multidisciplinary research is that each discipline has its own approaches, methods and terminology, shaped during the development period of the discipline. Those are most often dictated by availability of the data and data acquisition methods, which led the discipline in given direction, sometime influenced by personal choices of people having contributed to the discipline. This lecture introduced the basic concepts in climatology to enable the participants from the Public Health Sector to efficiently interact with the Climate and Meteorological Community. For example, the notion of scale (spatial and temporal) is central to understanding climate and climate analyses and leads automatically to the distinction between climate variability and climate change (e.g., ENSO). Understanding climate/meteorological data acquisition methods and sources, and related constraints on available information as well as the basic distinction between data and information are also necessary steps to build a common understanding of what is possible. The most common analysis methods used in climate sciences were introduced with emphasis on the importance of scale adequacy for the problem at stake.

Recommended reading:

IPCC 4th Assessment FAQs

» http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faqs.html

FAQ 1.1, 1.2,1.3,2.1, 6.1, 6.2, 10.1

Core Concepts in Public Health and Epidemiology, by Judy Omumbo, IRI

Summary:

Epidemiologists are concerned with the analysis of disease risk within population groups. Disease risk waxes and wanes between populations, geographical areas and in time. This variation is driven by environmental and social change. In the case of climate sensitive diseases, variations in disease risk are also driven by climate variability on a seasonal, annual, inter-annual or even decadal time scale. This seminar described how time and space are used as an epidemiological framework to measure and monitor variability in disease risk. Trainees learned how to capture and store spatial and temporal information and what aspects of space and time need to be measured and monitored for disease risk management. The rationale for organizing information, within a time and space framework and identifying patterns and associations, with the aim of providing insight to epidemiological processes was discussed.

Recommended reading:

Lafferty KD. The ecology of climate change and infectious diseases. Ecology 2009;90(4):888-900

Public Health Surveillance and Opportunities to use Climate Information, by Richard Luce, CDC

Summary:

The main purpose of surveillance is to control a disease or health condition. Therefore, surveillance is the critical foundation of knowledge upon which public health response, programs, and policy depend. Surveillance is the obligatory first step that is required to objectively identify a health problem. Once identified it is possible to investigate underlying contributing factors. Quality surveillance ensures appropriate and targeted interventions, more effective use of resources as well as meaningful monitoring and evaluation of control and prevention programs. Collection of surveillance data should be interpreted, analyzed and disseminated and linked to public health action. The use of climate data in surveillance is underdeveloped, but has the potential to enhance the usefulness of surveillance by adding predictive and explanatory power.

Recommended readings:

Nsubuga P, White ME, Thacke SB, Anderson MA, Blount SB, Broome CV, et al. Public Health Surveillance: A Tool for Targeting and Monitoring Interventions. In: Disease Control Priorities in Developing Countries, 2nd edition; 2006. p. 997-1015.

Centers for Disease Control and Prevention, Department Of Health And Human Services. Malaria Surveillance — United States, 2007. Morbidity and Mortality Weekly Report 2009;58(SS-2):1-17.

History of Climate and Malaria – Does Causality Matter?,
by Menno Bouma, London School of Hygiene and Tropical Medicine

Summary:

The empirical association between weather-climate and diseases goes back a few thousand years. However, the attribution of causality has been, as illustrated by the origin of the word "malaria" - and still is, a major challenge. Supra-annual "cycles" observed in parts of the malarial world, offer, if predictable, the possibility to be forewarned and forearmed. Sea surface temperatures and air pressure anomalies in the Pacific related to El Nino, and other climate-weather anomalies, show such promise for malaria and some other diseases. The deterministic mechanisms however are not always obvious, and some have even questioned the need to consider climate at all. An overview was given of periodic malaria epidemics on a global scale, and the possible climatic and non-climatic explanations, with some methodological pitfalls and the difficulties in some cases to attribute causality. Understanding the precise mechanisms and the contextual determinants are important for Malaria Early Warning Systems to become operationally relevant.

Recommended readings:

Bouma MJ, Sondorp HE, Van der Kaay HJ. Climate change and periodic epidemic malaria. The Lancet 1994;343(8910):1440.

Zurbrigg S. Re-thinking the" human factor" in malaria mortality: the case of Punjab, 1868-1940. Parassitologia 1994;36:121-121.

Summarizing Climate and Health Data Using Descriptive Statistics and Map Tools, by Michael Bell, IRI

Summary:

As a first step to understanding or summarizing a data set of observations, whether of climate or health information, it is often useful to calculate exploratory or descriptive statistics of the data. The IRI Data Library includes functions and options useful for calculating and displaying such statistics. This session presented fundamentals of using Expert Mode in the Data Library and practical exercises to calculate measures of central tendency and spread and spatial averages of gridded data.

Recommended reading:

Statistical Techniques in the Data Library: A Tutorial

» http://iridl.ldeo.columbia.edu/dochelp/StatTutorial/

Module II: Sources and Tools for Analyzing Climate and Public Health Data (Days 3, 4, 5)

Day 3: Wednesday, May 19, 2010

Climate and Vector-Borne Diseases Dynamics, by Madeleine Thomson, IRI

Summary:

Vector-borne diseases present serious problems to human health and welfare around the world, especially in tropical and subtropical regions. According to recent reports of the World Health Organization nearly half of the world's human population is affected by vector-borne diseases; with malaria, schistosomiasis, onchocerciasis and leishmaniasis infecting 270, 200, 90, 18 and 12 million people, respectively.

The role of climate in the transmission dynamics of vector-borne diseases in the context of replication of disease agents in their vectors and breeding, survival, distribution, abundance and longevity of vectors were discussed. Due attention was also be given to the impact of climate change on the pattern of disease transmission and the geographical distribution of some diseases.

Recommended reading:

Gage KL, Burkot TR, Eisen RJ, Hayes EB. Climate and vector-borne diseases. American journal of preventive medicine 2008;35(5):436-450.

Malaria Vector Distribution and Rainfall, by Judy Omumbo, IRI

Summary:

Public health practitioners must make decisions based on quick assessments relying on limited information. This exercise uses a map tool to spatially describe the distribution of malaria vectors, enabling decision making on what would work best.

Key determinants of Anopheles mosquito distribution (the malaria vector) are their feeding, resting and habitat preferences, classifying them anthropophilic, exophilic, endophilic or zoophilic. Some studies have shown that where there are cattle around a homestead and malaria vectors are predominantly zoophilic, the human population tends to have less malaria infection. Most mosquitoes prefer to breed in stagnant fresh water but there are a few species that are salt water breeders. These behavior traits, however, are not absolute and a zoophilic vector may feed on humans if animal hosts are not readily available. The behavioral differences displayed by malaria vectors are exploited for targeting interventions for controlling malaria.

Recommended reading:

Coetzee M, Craig M, Le Sueur D. Distribution of African malaria mosquitoes belonging to the Anopheles gambiae complex. Parasitology today 2000;16(2):74-77

Exploratory Time Series Analysis, by Andrew W. Robertson, IRI

Summary:

Climate and epidemiological data are often recorded as time series of a measurement at some location. Historical records of weather data have lead to much of our understanding of weather and climate, in terms of daily weather fluctuations, seasonality, interannual "climate" variations, and longer term trends. Epidemiological time-series data may show similar and contrasting features, and exploratory analysis of (univariate) time series forms the starting point for more complex statistical analysis, to identify associations between health and climate data, for example.

The lecture illustrated simple exploratory analyses of univariate time series, including how time-averaging can be used to separate different aspects of a climate time series, such as weather, the seasonal cycle, interannual variability, and longer-term variability and trends. It also illustrated the differing characteristics of temperature, rainfall, and malaria count data using an example from Colombia, and considered the implications for defining "normal" and "unusual" features in time series, and identification of associations between climate and epidemiological data.

Recommended readings:

Tian L, Bi Y, Ho SC, Liu W, Liang S, Goggins WB, et al. One-year delayed effect of fog on malaria transmission:

a time-series analysis in the rain forest area of Mengla County, south-west China. Malaria Journal 2008;7(1):110.

Briët OJT, Vounatsou P, Gunawardena DM, Galappaththy GNL, Amerasinghe PH. Temporal correlation between malaria and rainfall in Sri Lanka. Malaria Journal 2008;7(1):77.

Malaria Mapping and the Climate Suitability for Malaria Transmission Tool in the Health Map Room, by Judy Omumbo, IRI

Summary:

Disease maps are an important epidemiological tool for understanding the variability of disease distribution in time and in space, which is in part determined by climate. Maps of the suitability of climatic conditions for malaria transmission in a region have been applied widely in areas where empirical disease data are sparse, including for malaria control programs. The development of the malaria parasite and the mosquito vectors is sensitive to temperature, rainfall and humidity. Rainfall plays an important role in the distribution and maintenance of vector breeding sites. Temperature regulates the development rate of both the mosquito larvae and the malaria parasite, Plasmodium falciparum, within the mosquito. Relative humidity and temperature play an important role in the survival and longevity of the mosquito. Using historical data under laboratory conditions, Climate Suitability for Malaria Transmission is defined as the coincidence of precipitation accumulation greater than 80 mm, mean temperature between 18°C and 32°C, and relative humidity greater than 60 percent.

Recommended readings:

Craig MH, Snow RW, Le Sueur D. A climate-based distribution model of malaria transmission in sub-Saharan Africa. Parasitology today 1999;15(3):105-110.

Grover-Kopec EK, Blumenthal MB, Ceccato P, Dinku T, Omumbo JA, Connor SJ. Web-based climate information resources for malaria control in Africa. Malaria Journal 2006;5(1):38

Panel Discussion at the Mailman School of Public Health, Columbia University: Creating a "climate-smart" community: How do we Communicate? Who do we Train?

Opening speech: Linda Fried, Mailman School of Public Health (invited)

Facilitator: Madeleine Thomson, IRI

Panelists: Elliot Wayne, Met Office UK ; Richard Luce, CDC, Ethiopia, Field Epidemiology Training Programs Resident Advisor; Patrick Kinney, Columbia Climate and Health Program, Mailman School of Public Health

Summary:

Increasing the health community's capacity to understand, use, and demand the appropriate climate information is of primary importance to efforts to diminish the health impacts of climate change and climate variability. However, good information is not enough. The health community must also be able to distinguish between different kinds of data to determine what is relevant, at what time scale, to their population.

To fill the current gaps, we must develop research and professional training in the use of climate information for public health decision-making that can be launched in centers of learning throughout the globe. Here, an expert panel discusses the opportunities and challenges we face in the creation of a "Climate Smart" health community.

Day 4: Thursday , May 20, 2010

Remote Sensing as a Tool to Manage Environmental Data, by Pietro Ceccato, IRI

Summary:

Remote sensing is the science of obtaining information about an object through the analysis of data acquired by a device (sensor) that is not in contact with the object (remote). As you read these words, you are employing remote sensing. Your eyes are acting as sensors that analyze the electromagnetic waves (visible light) reflected from this page. The light your eyes acquire is analyzed in your mental computer to enable you to explain the words. Apart from the eyes, more sophisticated sensors have been developed to measure the electromagnetic waves in domains outside the visible. By measuring the electromagnetic waves in domains from Gamma rays to Microwaves, we can retrieve information on objects we want to study.

Recommended readings:

Ceccato P, Dinku T. Introduction to Remote Sensing (unpublished)

Ceccato P, Connor SJ, Jeanne I, Thomson MC. Application of Geographical Information Systems and Remote Sensing technologies for assessing and monitoring malaria risk. Parassitologia 2005;47(1):81-96.

Introduction to Cluster Analysis, by Andrew Robertson, IRI

Summary:

In multivariate data analysis, identifying any shared behavior between locations or variables is a key simplifying step. This lecture taught how such data can be stratified into groups using cluster analysis, in order to identify patterns, and to facilitate the identification of associations between climate and health data.

The lecture showed how the K-means method partitions a set of observations into sub-groups, based on their similarity according to a measure of the "distance" between them, and so as to minimize the scatter within each cluster. Examples included were July temperatures at US cities, and malaria data gathered for Eritrea.

Recommended readings:

Ceccato P, Ghebremeskel T, Jaiteh M, Graves PM, Levy M, Ghebreselassie S, et al. Malaria stratification, climate, and epidemic early warning in Eritrea. The American journal of tropical medicine and hygiene 2007;77(6 Suppl):61.

» http://en.wikipedia.org/wiki/K-means_clustering

Remote Sensing Tools in the Health Map Room, by Pietro Ceccato, IRI

Refer to: Day Four, Morning Sessions, Remote Sensing as a Tool to Manage Environmental Data, by Pietro Ceccato, IRI

Day 5: Friday, May 21, 2010

Using GPS, GIS and Google Maps for Public Health, by Mark Becker, CIESIN

Summary:

GPS is an increasingly popular way of collecting location information related to health studies. With GPS we can easily create highly accurate spatial data files to indicate the location of health clinics, schools, transportation routes and patient's home locations or village location. In this exercise students will learn the proper use of a standard GPS data collection unit and gain an understanding of procedures to insure data accuracy and integrity. Students will also learn what tools are available for downloading their GPS data and converting it into formats accepted by, Google Earth®/Google Maps® and ArcGIS®.

Recommended readings:

Montana L, Spencer J. Incorporating Geographic Information into MEASURE Surveys: A Field Guide to GPS Data Collection and Demographic and Health Survey GPS Cluster Position Form. Calverton; 2005.

Meningitis and the Environment: Meningitis Environmental Risk Information Technologies (MERIT), by Madeleine Thomson, IRI

Summary:

Meningococcal meningitis is an environmental disease whose spatial and seasonal distribution is readily described by climatic and environmental characteristics. Epidemics of meningococcal meningitis occur throughout sub-Saharan Africa, most frequently in an area, known as the 'Meningitis Belt' that stretches from the Sahelian zone of West Africa to the Horn of Africa. This region is a major source of atmospheric dust over most of north and western Africa and has epidemics and seasonal upsurges in endemic disease in the latter part of the dry season, characterized between November and May by low absolute humidity and the dust-laden Harmattan trade winds. Given the association of the epidemics with a dry and dusty environment and their higher incidence in the 'Meningitis Belt', recent research has focused on developing maps that identify the populations at high risk of epidemics and climate-driven early warning systems that could provide longer lead-times for initiating response. The relevance of this work to the implementation of current and future epidemic meningitis control strategies in Africa will be discussed.

Recommended readings:

Cuevas LE, Jeanne I, Molesworth A, Bell M, Savory EC, Connor SJ, et al. Risk mapping and early warning systems for the control of meningitis in Africa. Vaccine 2007;25:A12-A17.

Roberts L. Infectious disease: an ill wind, bringing meningitis. Science 2008;320(5884):1710-1715.

Additional resources:

Video: The International Research Institute for Climate and Society at the Earth Institute CU. Climate and Health in Africa. Google Tour;2009. Available from : http://www.google.com/landing/cop15/

Visit the Web-page of the MERIT initiative

» http://Merit.hc-foundation.org

Lagged correlation of Rainfall with Malaria Incidence, by Michael Bell, IRI

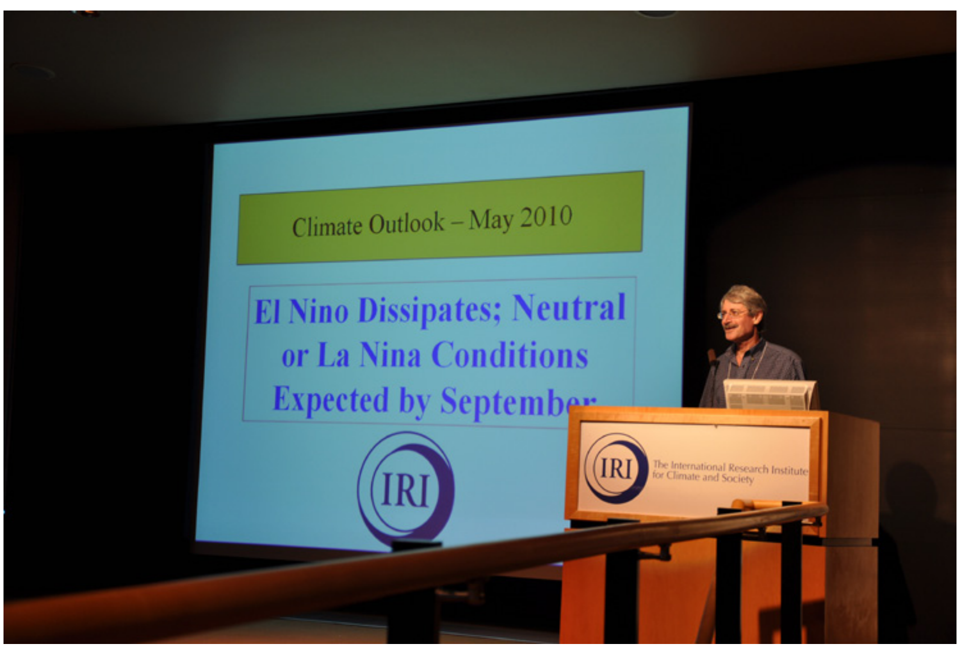
Summary:

One challenge of relating climate conditions to epidemiological conditions is to re-express these data in the same spatial and temporal framework. For example, while epidemiological data may be collected by health district, climate data are often available by station or in a gridded format. This session showed how to use the Data Library to put climate and health data into a common spatial and temporal framework, map data by district, and calculate correlations and lagged correlations by district.

Recommended reading:

Statistical Techniques in the Data Library, A Tutorial:

» http://iridl.ldeo.columbia.edu/dochelp/StatTutorial/



IRI Tony Barnson lectures during the SI10 special Climate Briefing. Francesco/IRI

Exercises on K-means and Cluster Analysis: Malaria Seasonality, by Pietro Ceccato, IRI

Summary:

Cluster analysis or clustering is the assignment of objects into groups (called clusters) so that objects from the same cluster are more similar to each other than objects from different clusters. Often similarity is assessed according to a distance measure. Clustering is a common technique for statistical data analysis, which is used in many fields, including machine learning, data mining, pattern recognition, image analysis and bioinformatics.

Module III: Use of Climate Information in Decision-making for Climate-Sensitive Diseases (Days 6, 7, 8, 9, 10)

Day 6: Monday , May 24, 2010

Understanding Predictions and Projections in Climate, by Sylwia Trzaska, IRI

Summary:

Climate forecasts or projections are often misinterpreted due to their probabilistic format, often omitted in sectoral applications. There is more and more interest in health impact of the future climate so it is important that the current generation of Public Health professionals understands what the projections can or cannot tell us. The lecture aimed at explaining why forecasts/projections can only be produced in a probabilistic format, which, in fact, attempts to quantify the uncertainty attached to the forecast output. Sources of uncertainty as well as the main forecasting methods will be presented. We will devote some time to a practical interpretation of two examples of forecasts: the seasonal forecast and the Climate Change scenario. An important element for the decision process, forecast verification, will also be briefly introduced.

Recommended readings:

IRI Tutorials on forecasting

» http://iri.columbia.edu/climate/forecast/tutorial and http://iri.columbia.edu/climate/forecast/tutorial2

IPCC 4th Assessment: Introduction to regional projections in chapter 11. Available from:

» http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch11s11-1-2.html

FAQs:

» http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faqs.html

Spatio-temporal Modeling of Meningitis, by Peter Diggle, Lancaster School of Health and Medicine

Summary:

Meningitis incidence across the "meningitis belt" of sub-Saharan Africa shows an irregular cyclic pattern, with large year-to-year variations. In the affected countries, incidence data are typically collected weekly at district level, and a local epidemic declared in any district for which incidence exceeds a fixed threshold. Three limitations of this approach are:

1) it is reactive rather than anticipatory;

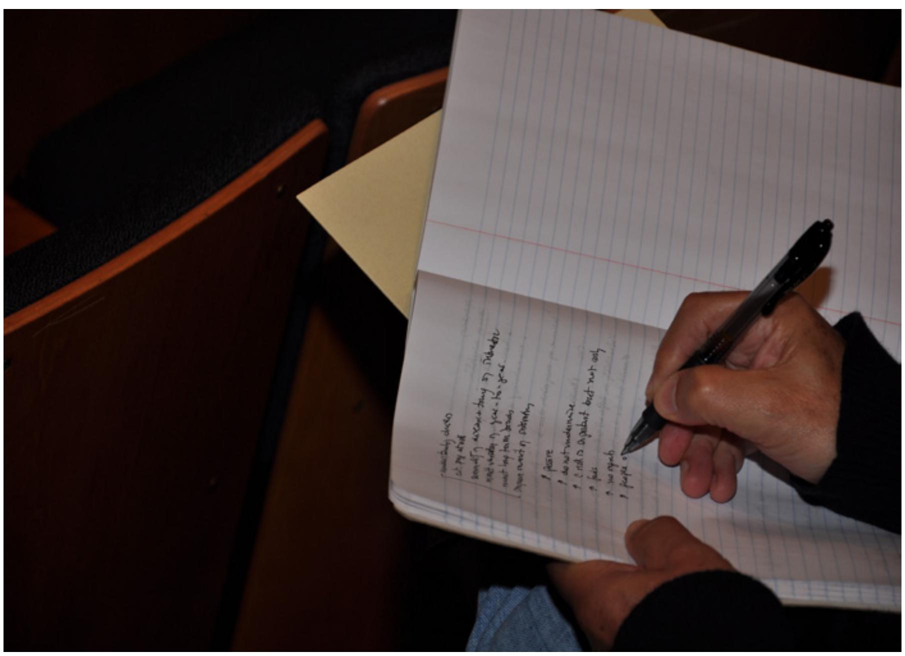
2) it does not draw on relevant information from incidence in neighboring districts;

3) nor does it make use of patterns of association between incidence and environmental predictors.

In this lecture, data from Ethiopia was used to show how recently developed statistical methodology for spatio-temporally indexed data can be used to develop a predictive approach to meningitis incidence that attempts to overcome the above limitations.

Recommended reading:

Fanshawe TR, Diggle PJ, Rushton S, Sanderson R, Lurz PWW, Glinianaia SV, et al. Modelling spatio-temporal variation in exposure to particulate matter: a two-stage approach. Environmetrics 2007;19(6):549-566.



Francesco Fiondella/IRI

Using GIS to Exploring the Links between Poverty and Natural Hazards, by Mark Becker, CIESIN.

Summary:

This is a hands-on GIS laboratory exercise that has students learning to use the analysis tools in ArcGIS® to explore the relationship of poverty levels and exposure to natural hazards. Students will become familiar with the primary spatial data sets used to illustrate poverty and natural hazards across the globe. Students will produce a series of final products including maps and charts to show the results of their analysis.

Recommended reading:

Warner K, Erhart C, de Sherbinin A, Adamo SB, Chai-Onn TC. "In search of Shelter: Mapping the effects of climate change on human migration and displacement." A policy paper prepared for the 2009 Climate Negotiations. Bonn: United Nations University Institute for Environment and Human Security, CARE International, and Center for International Earth Science Information Network at the Earth Institute of Columbia University; 2009.

Day 7: Tuesday May 25,2010

Climate Change, War and Disease, by Dia El Naiem, University of Maryland

Summary:

The Epidemiology of vector-borne diseases is influenced by climatic factors that affect the ecology of the vectors and the exposure of human populations to the pathogens. This lecture addresses the eco-epidemiology of visceral leishmaniasis (VL, kala-azar), a neglected tropical disease that occurs within a defined climate space and affects some of the poorest communities in the world. One of the notable features of the epidemiology of kala azar in East Africa is that it remains silent for many years and then erupts in severe epidemics that affect the lives of thousands of people. Although environmental information models allowed the prediction of the transmission areas of the VL in Sudan, studies have overlooked the importance of climate-related socioeconomic factors that lead to Darfur War and migration of susceptible populations into kala azar transmission foci.

Recommended readings:

Elnaiem DA, Schorscher J, Bendall A, Obsomer V, Osman ME, Mekkawi AM, et al. Risk mapping of visceral leishmaniasis: the role of local variation in rainfall and altitude on the presence and incidence of kala-azar in eastern Sudan. The American journal of tropical medicine and hygiene 2003;68(1):10.

Thomson MC, Elnaiem DA, Ashford RW, Connor SJ. Towards a kala azar risk map for Sudan: mapping the potential distribution of Phlebotomus orientalis using digital data of environmental variables. Tropical medicine and international health 1999;4(2):105-113.

Malaria Early Warning and Early Response, by Stephen Connor, IRI

Summary:

Climate informed Malaria Early Warning Systems (MEWS) have been of interest for many years – at least since the beginning of the 20th century. The rationale behind MEWS is simply the pursuit of reliable and timely information

on any changes in epidemic potential occurring that may be taking place. The information needs to be focal, i.e. applicable to specific geographic regions prone to epidemics; and timely, i.e. able to offer sufficient lead time for health services to be able to mobilize effective prevention and control interventions.

The integrated Malaria Early Warning and Response System approach developed since the inception of Roll Back Malaria in 1998 aims to assemble a set of available indicators from the spectrum between these two extremes, and to use these indicators to build up incremental evidence to stimulate and guide more timely and focal prevention and control of malaria epidemics.

Recommended readings:

Thomson MC, Doblas-Reyes FJ, Mason SJ, Hagedorn R, Connor SJ, Phindela T, et al. Malaria early warnings based on seasonal climate forecasts from multi-model ensembles. Nature 2006;439(7076):576-579.

DaSilva J, Garanganga B, Teveredzi V, Marx SM, Mason SJ, Connor SJ. Improving epidemic malaria planning, preparedness and response in Southern Africa. Malaria Journal 2004;3(1):37.

Integrated Malaria Surveillance and Control System for Malaria in Colombia, by Daniel Ruiz, IRI

Summary:

Dynamical models have played a significant role in understanding the complexity of malaria transmission dynamics. In the first part of this lecture students were exposed to the framework of several malaria process-based models. In the second part, they were exposed to several of these tools to: (a) explore the role that both climatic and non-climatic factors play in fluctuations and trends in malaria incidence; (b) compare their simulation outputs with actual malaria morbidity profiles observed in a specific malaria-prone region; (c) simulate the impact of intervention campaigns; and (d) assess several changing climate and future scenarios. Finally, the group explored the ongoing efforts of the Colombian Integrated Surveillance and Control System project.

Recommended reading:

Ruiz D, Connor SJ, Thomson MC. A Multimodel Framework in Support of Malaria Surveillance and Control. In: Thomson MC, Garcia Herrera R, Beniston M, editors. Seasonal Forecasts, Climatic Change, and Human Health: Springer Netherlands; 2008. p. 101-125.

Epidemic Detection and Monitoring using Thresholds, by Patricia Graves, the Carter Center

Summary:

Detailed empirical data on malaria cases in space and time is needed in order to define the normal situation of malaria in a given area and to define epidemics. The geographical units used in the definition should correspond to planning units to facilitate response and prevention. Examples of malaria epidemics are illustrated with reference to a dataset of cases by subzone and month from Eritrea, 1997 to 2003. Several different proposed methods for estimating malaria epidemic thresholds were given, including third quartile, the mean plus 1 or 2 standard deviations, the moving average and the C-Sum method. It was emphasized that an epidemic definition is a practical and planning decision, with no objective standard. The participants produced graphs that illustrate the different thresholds estimated for particular subzones and quantify epidemics that occurred in particular time periods as an indicator of malaria control or for relating to climate factors.

Recommended readings :

Hay SI, Simba M, Busolo M, Noor AM, Guyatt HL, Ochola SA, et al. Defining and detecting malaria epidemics in the highlands of western Kenya. Emerging Infectious Diseases 2002;8(6):555-562.

Cullen JR, Chitprarop U, Doberstyn EB, Sombatwattanangkul K: An epidemiological early warning system for malaria control in northern Thailand. Bull World Health Organ 1984, 62:107-114.

Day 8: Wednesday , May 26,2010

Temperature Trends in the Highlands of Kenya, by Bradfield Lyon, IRI

Summary:

Several studies have considered the impact of climate change, and temperature in particular, on the distribution and incidence of malaria in the highland regions of East Africa. The results, however, often led to different conclusions. This was in part related to the fact that they typically used different climate datasets that were either interpolated analyses based on station observations or an insufficient set of station observations, or length of record, for the specific areas of interest.

It is indeed a critical issue to understand the climate (or health) data being used in any study, including limitations in using such data before conducting any analysis. This includes the issue of data quality but also using the appropriate time scale of information (e.g., daily versus monthly rainfall data) for the health question being considered. One needs to take into account the caveats to using gridded data derived from point observations, for example, to avoid drawing potentially inappropriate conclusions from the analysis. Indeed, any analysis should begin with a simple, exploratory step that can subsequently be followed by more sophisticated methods. It is recommended that when undertaking interdisciplinary studies experts from across disciplines are involved to help minimize misinterpretation of the datasets being used.

Recommended readings:

Hay SI, Cox J, Rogers DJ, Randolph SE, Stern DI, Shanks GD, et al. Climate change and the resurgence of malaria in the East African highlands. Nature 2002;415(6874):905-909.

Patz JA, Hulme M, Rosenzweig C, Mitchell TD, Goldberg RA, Githeko AK, et al. Climate change (Communication arising) Regional warming and malaria resurgence. Nature 2002;420(6916):627-628.

Linking ENSO and Society, by Tony Barston, IRI

Summary:

ENSO (La Niña and El Niño) refers to the year-to-year variation of sea surface temperature in the central and eastern tropical Pacific relative to its long-term average. The state of ENSO is important because it is known to influence the climate throughout various parts of the world, depending on the season, making possible advance warning of above or below average precipitation and/or temperature. Such variations of seasonal climate, in turn, may affect society in many ways. Some of these impacts are obvious, such as a negative impact of below-average rainfall on agricultural yield and on water reservoirs, or of above-average rainfall on malaria incidence in regions of epidemic malaria. Other impacts may be positive, such as reduction in heating requirements for extra tropical regions having a warmer-than-normal winter related to the ENSO state. Here we discuss these and other ways in which ENSO matters to human society, and how its effects can be anticipated and managed—both to minimize negative effects and exploit positive ones.

Recommended readings:

McPhaden MJ, Zebiak SE, Glantz MH. ENSO as an integrating concept in earth science. Science 2006;314(5806):1740.

Thomson MC, Mason SJ, Phindela T, Connor SJ. Use of rainfall and sea surface temperature monitoring for malaria early warning in Botswana. The American journal of tropical medicine and hygiene 2005;73(1):214.

Climate Change and Vulnerability, by Carlos Perez, IRI

Summary:

Adaptation to the beneficial and deleterious impacts of climate change is a priority, and there is growing attention to integrate adaptation and mitigation as key components of a vision of and a strategy for sustainable development. It is important to identify, develop and implement effective responses to enhance adaptive capacity and reduce vulnerability of populations, regions and economic sectors. The presentation and discussions among participants focused on themes related to promoting planned and autonomous adaptation in order to improve resilience in a changing climate. The presentation pointed out the important role that the scientific community may play in advancing the information and knowledge base that would help in adaptation.

Recommended readings:

Heltberg R, Siegel PB, Jorgensen SL. Addressing human vulnerability to climate change: Toward a 'no-regrets' approach. Global Environmental Change 2009;19(1):89-99.

Patwardhan A, Downing T, Leary N, Wilbanks T. Towards an integrated agenda for adaptation research: theory, practice and policy: Strategy paper. Current Opinion in Environmental Sustainability 2009;1(2):219-225.

Climate Prediction for Weather Forecast Skeptics, by Simon Mason, IRI

Summary:

In order to predict the weather we need to know (a) what the weather is like now, and (b) how the current weather is likely to evolve. Our lack of knowledge of the exact weather conditions right now is the primary reason why weather forecasts become inaccurate after only a few days, because small errors in that knowledge rapidly grow into large errors in the predicted weather. Although it is impossible to forecast the exact weather at any given moment beyond a few days into the future, it is possible to predict whether wet, or dry conditions, for example, are likely to be unusually frequent and/or intense. These predictions are possible at seasonal scales because in some parts of the world, and at some times of the year, the atmosphere can be affected by unusual conditions at the earth's surface, especially the surface of the sea.

Recommended reading:

Mason SJ. "Flowering Walnuts in the Wood" and Other Bases for Seasonal Climate Forecasting. In: Thomson MC, Garcia Herrera R, Beniston M, editors. Seasonal Forecasts, Climatic Change and Human Health: Springer Netherlands; 2008. p. 13-29.

How to Use Maps as a Tool to Communicate Climate Risks, by Sabine Marx, Center for Research on Environmental Decision Making, and Francesco Fiondella, IRI

Summary:

Maps and other visual representations of data are integral forms of communication used by the climate- and meteorological-services communities. Examples include forecast maps of differing spatial and time scales, and environmental-monitoring data maps for humidity, dust and wind. Maps are powerful tools to bring out spatial distributions and relationships and make it possible to visualize and conceptualize patterns and processes that operate through space. However, in many instances, these visualizations fail at communicating valuable, usable, actionable information because they don't take into account the needs and intents of the users (health, water, agricultural, etc.). It was discussed some of the ways in which climate information can be communicated more effectively to different audiences.

Recommended readings:

Shome D, Marx S. The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public. NY: Center for Research on Environmental Decisions, Columbia University; 2009.

Ishikawa T, Barnston AG, Kastens KA, Louchouarn P. Understanding, evaluation, and use of climate forecast data by environmental policy students. Qualitative Inquiry in Geoscience Education Research 2010.

Weather Roulette: How to Make Decisions given Probabilistic Forecasts, by Simon Mason and Ashley Curtis, IRI

Summary:

A series of ten seasonal forecasts were issued, and the participants were required to make investment choices based on the forecasts. The forecasts were presented in standard format, with three probabilities indicating the chances of "below-normal", "normal" and "above-normal" rainfall. The forecasts and observations were drawn from a real operational set of forecasts and observations, but the location and years were not revealed so that the participants cannot cheat using any prior knowledge. The participants made profits or losses depending upon the amount invested on the category that occurs. Their profits and losses were accumulated over a ten-year period. The participants worked in pairs, and the team that accumulated the largest profit won.

Day 9: Thursday, May 27,2010

Climate Change and Human Health: Current Impacts and Future Risks, by Patrick Kinney, Mailman School of Public Health

Summary:

One of today's greatest public health challenges is to enhance population health in the face of emerging risks related to climate change. Scientists predict that climate change may lead to:

- Increasing heat-related deaths;
- Diverse health impacts of more intense storms and flood events;
- Risks to water quality, agricultural productivity, and regional peace due to shifting water resources;
- Worsening air quality and asthma;
- Changing patterns of vector-borne and other infectious diseases.

However, the scientific knowledge base upon which to build strategies to reduce health impacts of climate change is surprisingly sparse. By partnering with climate scientists, health scientists have the ability to make significant scientific advances to understand, anticipate, and prevent adverse health consequences. This lecture provided an introduction to this topic and discussed challenges and opportunities for new research.

Recommended readings:

Knowlton K, Lynn B, Goldberg RA, Rosenzweig C, Hogrefe C, Rosenthal JK, et al. Projecting heat-related mortality impacts under a changing climate in the New York City region. American journal of public health 2007;97(11):2028-2034.

Pan American Health Organization. Climate change and human health: risk and responses: revised summary 2008. Washington DC; 2008.

Heat Waves in the USA from the Climate Perspective, by Bradfield Lyon, IRI

Summary:

Reasons for studying heat waves were discussed followed by some of the difficulties in defining a heat wave. The concept of a heat index was then introduced. The 1995 heat wave in the US was considered by examining the large-scale atmospheric circulation associated with the heat wave as well as important local-scale features of the heat wave using Chicago as an example. The final segment of the lecture examined how all warming is not "equal" when considering climate change.

Recommended readings:

Kunkel KE, Changnon SA, Reinke BC, Arritt RW. The July 1995 heat wave in the Midwest: A climatic perspective and critical weather factors. Bulletin of the American Meteorological Society 1996;77(7):1507-1518.

Lebassi B, González J, Fabris D, Maurer E, Miller N, Milesi C, et al. Observed 1970–2005 Cooling of Summer

Daytime Temperatures in Coastal California. Journal of Climate 2009;22:13.

Heat Waves and Public Health: a USA Case-Study, by Kim Knowlton, Natural Resources Defense Council, and Department of Environmental Health Sciences, Mailman School of Public Health

Summary:

Heat waves have substantial acute effects on local populations. A large heat-mortality literature has evolved over the years, yet few studies of heat morbidity have been done. Recent work suggests that a single heat wave can have widespread effects. We discussed a US Case Study of morbidity during a 2006 California heat wave (Knowlton et al., 2009). Heat vulnerability factors included biomedical, demographic, housing, and community geographic characteristics. We can use this information to identify the most at-risk communities for climate sensitive health outcomes. Climate models project that the frequency, intensity, and duration of heat waves will increase in the future as climate change continues. The key message of the lectures was that climate-health preparedness can be enhanced by developing strategies that identify vulnerabilities, establish tracking systems, apply climate-smart design, and employ public education to protect the most climate-vulnerable among us today, thereby learning how to provide better climate-health protection for all of us in the future.

Recommended readings:

Knowlton K, Rotkin-Ellman M, King G, Margolis HG, Smith D, Solomon G, et al. The 2006 California heat wave: impacts on hospitalizations and emergency department visits. Environmental health perspectives 2009;117(1):61.

Harlan SL, Brazel AJ, Prashad L, Stefanov WL, Larsen L. Neighborhood microclimates and vulnerability to heat stress. Social Science & Medicine 2006;63(11):2847-2863.

Daily Quiz and Personal Projects

Quiz Questions by Module

Trainees were required to answer quiz questions on the daily basis.

The questions and answers per module are available in a separate appendix.

SI 10 Participants work hard during the morning QnA session. Francesco/IRI

Trainees Personal Projects Guidelines and Summaries

The following guidelines were provided to the trainees:

It is critical to ensure and capture the opportunity for participants of the Summer Institute to explore their own ideas through the course lectures, seminars, exercises and discussions and to demonstrate their newly acquired competency. Therefore, we would like you to begin, from the beginning of the training, to follow through on a personal project that you decide either individually or in a small group with individuals of both the health and climate communities. We are asking you to define your project and (when applicable) form your working group on the second day of the training and to provide this information to the Summer Institute Team during the first session of the third day of the training.

You will build up your project throughout the entire course, applying what you have learned - using either your own data, when applicable, or some datasets made available to you by the IRI - and linking these results to aspects of your own work or interest. For instance, the projects may explore the relationship between malaria and rainfall in the Kenya Highlands, or between dengue and temperature in Bogota.

We are asking you to develop your project using the results and figures obtained with your data (either personal or provided by the IRI) during the daily practical sessions. A pen drive will be provided to each participant to save these results on a daily basis. Some additional time will also be allocated everyday for you to work on your own projects.

Poster presentations of these projects will be made by the participants on the final day of the course, allowing participants the opportunity to share the learning experience with co-participants, facilitators, distance learners and the climate information for public health network. The poster should include (but not be limited to) the following items: brief overview of the project's targeted country, objectives, project's targeted audience/users, hypothesis, methods, results, interpretation (including new hypothesis that arose), tables and figures (when applicable). We are also asking you to frame your project in the context of public health decision-making.

These projects will not be graded but they will be used to share with co-participants, facilitators, instructors and distance learners. There will also be a "Best Poster Prize Committee" awarding outstanding poster presentations.

In addition to the poster, participants will need to write up a 300-word summary which would include the following: title, author(s)' name(s), author(s)' affiliation(s), background, objectives, hypothesis and methods, results, interpretation and conclusion. This summary needs to be written on a Word document.

Recommended resources:

The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public, by Debika Shome and Sabine Marx, Center for Research on Environmental Decisions, Columbia University, NY, available from:

» http://www.csc.noaa.gov/digitalcoast/inundation/pdf/CRED_Psychology_Climate_Change_Communication.pdf

Advice on Designing Scientific Posters, by Colin Purrington, Department of Biology, Swarthmore College, Pennsylvania, available from:

» http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm

Scientific Poster Design, Cornell Center for Materials Research, Cornell University, Ithaca, NY, available from:

» http://sciencetalk.posterous.com/toward-a-better-scientific-poster

Instances of projects conducted by participants to previous Summer Institutes (see next page). Please note that on previous years the assignment slightly different.

Project Summaries

The summaries of the trainees' projects may be found below. The full poster presentations are available from a separate appendix.

Typhoid Fever and Climate in Uganda: Is there a link?

Betty Abang, Centers for Disease Control and Prevention, Uganda

Typhoid fever is a food and waterborne disease caused by the bacterium Salmonella Typhi. Extreme weather events have been accompanied by outbreaks of typhoid. Populations with poor sanitation infrastructure often experience increased rates of typhoid fever after flood events. Transmission of enteric pathogens is generally higher during the rainy season. Typhoid fever has been reported to have no correlation with climate variables. Symptoms of typhoid fever appear 1-3 weeks after exposure to the bacterium. The mean annual incidence of typhoid fever in Uganda ranges between 10 and 100 per 100,000. The objective of this project was to investigate whether typhoid fever outbreaks vary with climate. The setting of the study was : Kasese district that is located in western Uganda, East Africa. The district has two lakes along its borders, Lake George and Lake Edward. District population in the year 2008 was 646,300.

Data on the number of cases of typhoid fever reported from Kasese district in 2008 were obtained from the Uganda government Ministry of Health. Daily precipitation data from the NOAA NCEP CPC FEWS Africa dataset in the IRI data library were aggregated to generate a monthly average for the year 2008 for Kasese district. Since the symptoms of typhoid fever appear 1-3 weeks after exposure to the bacterium, precipitation data were lagged by one month. These data were then graphed with typhoid fever incidence data.

The conclusions of the study are that there is no clear evidence of a link between occurrence of typhoid fever and rainfall. This analysis was limited by the fact that only one year of data was available to the author. The author recommends further analysis using data for a period of about 10 years. Analyses would include generating a climatology for a 10 year period and regression analyses to explore associations between incidence of typhoid fever and rainfall.

Trends of malaria in relation to rainfall at Alamata Hospital in Northern Ethiopia

Wakgari Deressa Amente. School of Public Health, Addis Ababa University, Ethiopia

Malaria is one of the leading causes of morbidity and mortality in Ethiopia. More than 75% of the country's landmass is malarious, and about 68% (>50 million people) of the total population resides in areas at risk of malaria. Malaria transmission in the country is highly influenced by local weather conditions, seasonal and inter-annual climate variations. The unstable nature of the disease makes all age groups of the population prone to epidemics. Although malaria epidemics are usually associated with rainfall pattern, studies related to the relationship between rainfall and malaria is generally scarce in Ethiopia.

The main objective of this study was to determine the pattern and relationship between malaria and rainfall. In this study it was hypothesized that high rainfall is significantly correlated with high incidence of malaria in the study area.

This study was conducted in Alamata Woreda (or District) of Tigray Region in Ethiopia. Located in the Southern Zone of Tigray, Alamata was inhabited by an estimated population of 85,000 in 2007. Malaria is the main cause of morbidity and mortality in the district. Historical malaria morbidity monthly data for nine years (Jan 1999 to Dec 2007) were collected from the OPD of Alamata Hospital. Monthly rainfall data for the district during the same period were retrieved from the Data Library at IRI for Climate and Society at Columbia University. Time series analysis was performed to assess the trend and relationship between malaria and rainfall.

The study revealed the monthly and yearly seasonality of malaria in the study area, peaking from August to November each year. High rainfall was recorded each year during the months of June to August. The years 1999 and 2003 experienced heavy rainfall. Following high rainfall during the 2003, malaria epidemics occurred in 2004 and 2005. However, declining trends of rainfall and malaria were observed since 2004 and 2006, respectively. Examination of the annual average of malaria and rainfall reveals a strong correlation between the two variables.

This study demonstrated strong correlation between rainfall and malaria, and high rainfall preceded the occurrence of high malaria incidence. The study also highlighted a possibility for developing malaria epidemics prediction model. The relationship between malaria and other climatic factors such as temperature and humidity should be further investigated.

Malaria Risk Mapping in Oromia Region, 2010, Ethiopia

Yilma Bekele. School of Public Health, Addis Ababa University, Ethiopia

Oromia region has 30 Million Population and 215 Malarious Districts. The malaria incidence rate was 21 per 1000 population based number of cases reported to Federal Ministry of Health of Ethiopia in 2008.

To analysis correlation historical malaria incidence/anomalies, Environmental factors (NDVI &MOUDIS), intervention factors and Produce malaria risk maps that can be used by disease control managers at districts.

Sample Size 50 districts that have 10 to 18 years monthly Malaria data selected for the study. The Inclusion Criteria used were: districts that have at least one Health facilities with Microscopic diagnostic facility of malaria, and more than 10 years malaria record and has meteorological station within catchment area of health facilities included for the study. From eligible health facilities 80 located in 50 districts included. Monthly confirmed malaria data collected from 80 facilities in 50 districts in Oromia region from July 1995 to December 2009. Climate Data: - monthly climatic data: temperature (Minimum and Maximum), rainfall and humidity for the study period collected from 76 meteorological Station in selected district of the region from National Metrology Agency of Ethiopia. Environmental data (NDVI, MOUDIS): - used from International Research Institute Data Laboratory (IRI DL). After verification the consistence of data the cleaned data uploaded to IRI DL and analyzed for correlation anomalies malaria incidence with climate anomalies (Temperature, Rainfall, and Humidity), NDVI, MOUDIS and intervention Variables (ITNS, IRS). The Climatic/ Environmental and Intervention factors strongly correlated used as predictors to construct malaria risk mapping.

From 50 sampled districts 33(66%) of collected according to scheduled. The majority of districts 31(93.9%) have more than 15 years confirmed malaria Data and the remaining have 10 years monthly Malaria Data. The mean was 14.45 and range was 6 years. There was strong correlation between Plasmodium falciparum monthly incidence rate and monthly mean Temperature and rainfall($r=0.065$, PV<0.00001, 95%) for the year 1995 to 2002 and no correlation found from 2003 to 2009 between climate factors and Plasmodium falciparum incidence rate. There was two months lag correlation between malaria incidence anomalies and precipitation anomalies for the year 1995 to 2002.

The correlation monthly malaria incidence rate and monthly mean temperature and rainfall found for the year 1995 to 2002, and similarly the lag correlation between malaria incidence anomalies and rainfall were better for the year 1995 to 2002. However, is no correlation from 2003 to 2009, may be due to policy change during these period. Therefore, beside the climatic factors to consider the intervention factors recommended for further study.

Mapping of Sand Flies in Tunisia.

Ali Bouattour. Pasteur Institute of Tunis-Tunisia

In Tunisia, 16 species of sand flies have been recorded. Some of them are implicated in the transmission of three species of Leishmania. Sand flies are very small insect (<3mm) and therefore they have an intimate relationship with their environment mainly temperature and humidity. The distribution and the occurrence of sand flies depend on the specific need of each species: habitat suitability. The Mediterranean region is predicted to have increases of temperature and changes in rainfall patterns in the near future (IPCC 2000). These may influence the ecology and biology of sand fly fauna and therefore the epidemiology of leishmaniasis in Tunisia. These two principle climatic factors may affect the distribution of the sand flies. The epidemiology of leishmaniasis in Tunisia has been changing during the last few decades regarding the increase in the spread of the visceral and cutaneous forms toward the south and on the emergence of a new cutaneous form in the north. Based on this new situation there is increasing concern regarding the possible impact of projected climate change on the distribution of sand flies that are involved in leishmaniasis transmission.

The objective of the project was to map the current sand fly distribution using GPS, GIS and Google Maps and Data-Library using climate and environmental variables such temperature, rainfall, relative humidity (RH) and NDVI. What we can concluded is that the mapping, the monitoring of the density and the dynamics of each species correlated with the climatic parameters used (temperature, rainfall and Relative Humidity) but is the vegetation the parameter that can help to predict the risk of high transmission period and then be able to prevent cutaneous leishmaniasis. But for that, there is a need to create a model using in addition to the number and location of each leishmaniasis cases.

Temperature and Mortality in Beijing, China.

Tiantian Li. Institute for Environmental Health and Related Product Safety, Chinese Center for Disease Control and Prevention, Beijing, China

Climate change has led to increasing temperatures in recent decades. A strong association between temperature and mortality has been identified for a number of cities around the world, mostly in Europe and North America. General nonlinear relations have been observed with increased mortality at high and low temperatures. However, the literature on the association between mortality and temperature in China is scarce. The objective of this study was to analyze the relationship between temperature and mortality in Beijing and estimate the impact of climate change on premature deaths in 18 districts in Beijing. The expose-response relationship between temperature and mortality was analyzed using time series Poisson GLM regression method. The summer heat related premature deaths were estimated by integrating the results from the exposure-response relationship and related parameters. A 10% rise in temperature yielded a 8.69% (95% CI: 6.30-11.04%) increase in mortality with the MMT (minimum mortality temperature) at 48.9% in Beijing. The people in different areas in Beijing have different adaptation ability for heat. For example, the people in the city have the worst adaptation ability, as evidence by the smallest MMT and biggest heat slope. Conversely, the people in the outer suburb have the best adaptation ability. The estimated total summer heat related premature deaths in Beijing in 2007 were 5510. The estimation showed that the city and the suburb areas closest to the city have very high premature deaths. The outer suburb areas have relatively lower premature deaths. This information may provide policy intervention guidance.

Analysis of the 1996-2007 Malaria Morbidity Data from the Kenyan Health Management Information System

Ayub Manya, Ministry of Public Health and Sanitation, Kenya

Malaria is the leading cause of morbidity and mortality in Kenya. Close to 70% of the population is exposed to the risk of the infection. Approximately 30% of outpatient attendance and 19% of all admissions in public health facilities is due to malaria. Close to 5% of those admitted due to the disease die. The most affected are children below five years of age and pregnant women.

The main source of malaria data is the Health Management Information System (HMIS). Despite its imperfect coverage and incompleteness, HMIS is a potential source of baseline epidemiological information that can be used to target interventions and track disease trends. Outpatient morbidity and climatic data for 1996-2007 were analyzed with the objective of determining malaria trends and establishing the climatic association. The null hypothesis for this study was that there was no relationship between observed malaria morbidity trends and the rainfall pattern.

We reviewed the 1996-2007 HMIS outpatient data from all the provinces. The excel databases were uploaded in the International Research Institute for Climate and Society (IRI) Data Library for analysis. Malaria trends for 1996 to 2007 were established and compared with the trends for all outpatient case. Malaria cases were then mapped according the provinces. Rainfall pattern for the same period was established using data from the IRI Data Library.

The result we found is that the malaria morbidity trend over the years was similar to the general outpatient trend with cases increasing from 1996 up to 2000. A decline of cases was noted from 2000, reaching the lowest peak in 2002. From 2003, there was a steady increase in cases up to 2006. Figures1 and 2 show the trends of the general outpatients and the malaria morbidity respectively.

Blooms of toxin-producing harmful algal Blooms on the Washington State Coast, USA: Climatological Patterns, Long Term Trends, and Relationships to Environmental Parameters

Stephanie K. Moore[1], Vera L. Trainer, Barbara M. Hickey[2]

[1]NOAA's West Coast Center for Oceans and Human Health, Seattle WA

[2]University of Washington, School of Oceanography, Seattle WA

The Olympic Region Harmful Algal Bloom (ORHAB) monitoring program began in 2000 to better manage outbreaks of marine biotoxins on the Washington State coast of the United States. The harmful algae and the toxins they produce are measured approximately twice monthly at 6 core locations. The primary phytoplankton species of concern are Pseudo-nitzschia. The toxin (domoic acid) accumulates in shellfish (razor clams) and causes Amnesic Shellfish Poisoning (ASP) is contaminated shellfish are consumed by humans.

Here we investigate seasonal patterns and long-term interannual trends in the abundance of Pseudo-nitzschia on the Washington State coast and determine if there are any relationships with environmental and climatic parameters.

This is an initial step towards an assessment of the possibility of developing an early warning system for toxigenic blooms of Pseudo-nitzschia on the Washington State coast. An early warning system that integrates cell counts with readily available indices of environmental and climate parameters would benefit State Health Authorities by informing harvesting and monitoring practices in space and time.

We hypothesize that 1) the seasonal development of blooms of Pseudo-nitzschia is related to environmental and climatic parameters, and 2) long-term interannual trends in bloom magnitude are related to anomalies in environmental and climatic parameters.

Cell abundances were provided from the ORHAB monitoring program. Seawater was collected from the surf zone at the 6 core monitoring locations. Pseudo-nitzschia cell counts were performed using light microscopy. The frequency of sample collection is patchy, but in general samples are obtained at weekly intervals during the summer-fall bloom season. Samples are obtained less frequently in the winter months, and are generally obtained twice monthly from Dec to Feb. Data are examined here from 2000 to 2008.

Gridded information on mixed layer depth (Behringer et al. 2004), sea surface temperature (Reynolds et al. 2006), and cloudiness (Kalnay et al. 1996) were obtained from the International Research Institute for Climate and Society (IRI) Data Library from Jan 2000 to Dec 2008. Monthly average values were calculated for the area 122°W-125°W and 46°N-49°N, and these values were used to calculate climatological monthly mean values and monthly anomalies. Monthly values of the Niño 3.4 index were also obtained to represent the behavior of the El Niño Southern Oscillation (Reynolds et al. 2006). The Niño 3.4 Index is the sea surface temperature anomaly in the region of the equatorial Pacific Ocean 120°W-170°W and 5°S-5°N. Seasonal patterns of bloom development and long-term interannual trends in bloom magnitude were compared to these environmental and climatic parameters.

The conclusions of the study were that Pseudo-nitzschia blooms typically occur in the summer and fall and coincide with shallow mixed layer depths and warm sea surface temperatures in the coastal ocean, as well as little cloud cover. However, no clear relationship could be found between the abundance of Pseudo-nitzschia cells and the environmental and climatic parameters when the seasonal pattern was removed. This indicates that other factors may be more important in determining the interannual variability in bloom magnitude. Interactions among parameters and time lags in the system may also be important. Identifying the "drivers" of exceptionally large bloom years on the Washington coast and the refinement of early warning systems remains an active area of research.

Mortality and Climate Variability at the National Hospital of Niamey, Niger

Mouhaimouni Moussa. National Meteorological Office of Niger

During the temperature outbreak that occurred between April and early May 2010 a lot of deaths had been recorded mostly elderly at the national hospital of Niamey. The objective and hypothesis of the study was to seek the link that could exist between the number of deaths and the maximum temperature in order to develop a model that will serve as a tool of early warning related to extreme temperature at Niamey.

Daily data from 1988 to 2009 where used to examine the variability of the maximum temperature and the number of death during that period after determining the threshold of the maximum temperature from witch people could die. There's a link between the heat waves and the death and it's getting hotter and hotter. With a threshold of 29°C the risk of death is about 100% mainly on March, April and May

Understanding Seasonality and Climate Variability as a tool for Disease Attenuation in Nigeria

Andrew Oniarah. Nigerian Meteorological Agency, Oshodi, Nigeria

Malaria is one of the diseases that contributed to health problems in Nigeria and this research intends to look at changes in seasons and the climate variability as it favors the spread of some of these diseases. The objective of this study is to examine the trend and the anomalies in the seasonal rainfall and identify seasons and years that favor the transmission of diseases in Nigeria using the west coast as a case study.

The data used for this study is the monthly rainfall data for 59 years (1951-2009) obtained from the Nigerian Meteorological Agency. The monthly data have been considered for three seasons. These are the Mar-May (MAM), June-August (JJA) and August-October (ASO) seasons. In each of the seasons, the rainfall trend is examined and the anomalies are deduced using the World Meteorological Organization (WMO) climatological years (1971-2000). The analysis was carried out using Microsoft Excel tool.

The result of the analysis shows that between the periods 1951 and 2009, rainfall had been on a steady increase for the MAM, JJA, and ASO seasons investigated for the coastal areas of Benin, Ikeja, Port-Harcourt and Warri. Ikeja and Benin depict high anomalous (above average) rainfall conditions between the period 1965 and 1970 during the MAM and JJA seasons, and this period coincide with years the area recorded high cases of malaria. In the recent years, Warri and Ikeja had shown more pronounced above average rainfall conditions during the JJA season.

The above average rainfall in MAM and JJA seasons in recent years is so pronounced, thereby, suggesting a favorable condition for the breeding of mosquitoes and hence increased chances of malaria, yellow fever and dengue. Both seasons showed upward trend in rainfall in the coastal areas investigated. We suggest adequate provision of preventive measures and malaria drugs, and we also recommend that further studies should be conducted with the aim of arriving at good and adequate

Distribution of Plasmodium vivax and Plasmodium falciparum in Lume district, Ethiopia.

Hiwot Teka[1] and Abenet Girma [2]

[1] USAID /PMI Ethiopia

[2] Climate and Health Working Group/Anti-Malaria Association

Malaria is one of the top 10 leading cause of outpatient consultations, admissions and deaths in Ethiopia. *Plasmodium falciparum* and *P. vivax malaria* are the two species found in Lume district, Ethiopia. Rainfall variability is known to affect the development of mosquito vectors. In this project it is aimed to test the hypothesis that a lagged correlation exists between rainfall and cases of P. vivax and P. falciparum. The objective of the project is to assess the temporal distribution of malaria parasite across Lume district, Oromia region, Ethiopia and to see if there exists a relation between rainfall and P. vivax and P. falciparum. Satellite data of rainfall in Lume district was extracted from the IRI data library to compare against the distribution of P. vivax and P. falciparum cases. Monthly malaria case data from Lume district was used for analysis. Lagged correlation analysis was used to assess the correlation between rainfall and malaria cases.

The results highlight the lagged correlation of malaria cases with rainfall from 1998-2004 though the relationship was not strong. Seasonal analysis of rainfall and malaria showed the same trend. The decrease in malaria cases after 2004 could not be explained by the variation in precipitation; other climatic and intensified intervention efforts put in place by the Ethiopian Federal Ministry of Health could be contributing factors.

Relationships between climate and year-to-year variability in meningitis outbreaks: A case study in Burkina Faso and Niger

Yaka P. [1], Sultan B. [2], Janicot S. [2], Broutin H. [3], Philippon S. [1], Fourquet N. [1]

[1] Direction de la Météorologie, 01 BP : 576, Ouagadougou, Burkina Faso / ProdiG, UMR 8586, 2 rue Valette, 75005 Paris, France

[2] IRD – LOCEAN/IPSL (UR 182, UMR 7159 IRD-CNRS-UPMC) Université Pierre et Marie Curie, 4 place Jussieu, 75252 Paris cedex 05, France.

[3] G.E.M.I, UMR CNRS/IRD 2724, Equipe « Evolution des Systèmes Symbiotiques »

Institut de Recherche pour le Développement (IRD), 911 Avenue Agropolis, BP 64501
34394 Montpellier Cedex 5, France

Every year, West Africa is afflicted with Meningococcal Meningitis (MCM) disease outbreaks. Although the seasonal and spatial patterns of disease cases are closely linked to climate, the mechanisms responsible for these patterns are still not well identified.

The objective of this study is to investigate the role of climate on the triggering of MCM epidemics by using a long-term dataset and to explore the possibility to include the climate conditions as a predictor of meningitis epidemics.

Our hypothesis, based on literature, is as so: dry and windy weather conditions in early winter might cause damage to the mucous membranes of the respiratory system and/or inhibits mucosal immune and therefore create propitious conditions to the triggering of MCM epidemics

A statistical analysis of annual incidence of MCM and climatic variables has been performed to highlight the relationships between climate and MCM for two highly afflicted countries: Niger and Burkina Faso. We found that disease resurgence in Niger and in Burkina Faso is likely to be partly controlled by the winter climate through enhanced Harmattan winds. Statistical models based only on climate indexes perform well in Niger showing that 25% of the disease variance from year-to-year in Niger can be explained by the winter climate but fail to represent accurately the disease dynamics in Burkina Faso.

The disease resurgences in Niger and in Burkina Faso are linked with an enhancement of the winter conditions, such as enhanced Harmattan winds over Niger in November/December and over Burkina Faso in October.

This study is an exploratory attempt to predict meningitis incidence by using only climate information. Although it points out significant statistical results it stresses the difficulty of relating climate to interannual variability in meningitis outbreaks.

Course Awards

For the first time since the implementation of the Summer Institute, award prizes were implemented to acknowledge outstanding performances.

As acknowledged by the Poster Prize Committee, the "Best Poster" award was attributed to (by order of merit): Tiantian Li from the CDC of China, Betty Abang, from the Uganda CDC, Office of Uganda and Pascal Yaka from the Burkina Faso Meteorological Office.

The "Excellence in Teaching," award was attributed by the trainees to Pietro Ceccato, from the IRI. Tony Barston, from IRI, received an award in recognition of his involvement, active interaction and timeliness during the pre course development.

The "Best IT Innovation" prize was attributed to Jeffrey Turmelle, from the IRI, for the development of the CIPHAN Web-page. Sandy Vitelli, from the IRI, received the award for "Best Logistic Support", and the award for "Best innovation in the development of the course curriculum" was attributed to Laurence Cibrelus, also from the IRI.

The SI10 Evaluation Team (from left to right): IRI Gilma Mantilla, Lancaster School of Medicine Michelle Stanton and IRI Laurence Cibrelus. Francesco/IRI

Course Evaluation

All course participants, including the trainees, facilitators, organizers and support staff, were invited to provide feedback on various aspects of SI 10. This evaluation process was completed online and consisted of various multiple choice and open-ended questions, and was led by Michelle Stanton, a 2008 Summer Institute alumna. The process was entirely anonymous and provided all participants with the opportunity to comment on the design and delivery with the purpose of using this information to improve future climate and health training courses.

The detailed evaluation process is available on a separate document, but the main conclusions are summarized in the next paragraph.

Organizers of SI2010 (from left to right): IRI Stephen Zebiak, IRI Madeleine Thomson, CIESIN Mark Becker, MSPH Patrick Kinney. Francesco Fiondella/IRI

Conclusions

SI 10 was deemed to be a success by both trainees, facilitators, organizers and support staff. The trainees were very satisfied with the contents of the course, and in particular praised the amount of hands-on experience they were able to acquire. Further, the course provided an environment in which members of the public health and climate communities could exchange ideas and form collaborations, which will extend beyond the confines of the course itself. Trainees benefitted greatly from the expert knowledge provided by the course facilitators, and from the experience of the organizers and support staff in addition to expressing enthusiasm about taking these skills to their own institutions in order to train others.

Trainees, facilitators, organizers and support staff regarded the SI 10 very highly. It is clear from the evaluation reports that the greatest strengths of SI 10 are the involvement of experts from a variety of backgrounds in delivering the contents of the course, and the practical experience gained through the afternoon sessions using the Data Library. Through encouraging discussions between the trainees and the facilitators, the SI 10 has facilitated the exchange of ideas, which are likely to lead to future collaborations between members of the climate and health community. Further, SI 10 has provided a framework that trainees intend to follow in order to provide training in their own institutions.

New features of SI 10 included a daily review session lead by a trainee, a discussion of the previous day's sessions lead by one the facilitators, a daily quiz, giving the trainees the opportunity to use their own data for their projects, developing poster presentations and using the CIPHAN Web-page as a support to the course. On the whole, these additions were very well received and assisted in consolidating the key points of each of the sessions, and further successfully encouraged the trainees to feel more involved in their projects. The facilitators also appreciated the daily review sessions as they aided in reassuring them that their main messages had been successfully conveyed.

In addition to the praise the course received, a number of recommendations to take into account when planning the future courses were proposed. The most frequently mentioned proposition, made by both trainees and facilitators, related to the project and the practical exercises. It was recommended that more time be allocated to complete the practical tasks and to work on the projects. This would improve the trainees' understanding of the skills that they had been taught, and increase their confidence in using the Data Library. Trainees expressed some confusion relating to what data was required for their projects; hence clearer guidelines for this would also be beneficial. Further, it was suggested that there is a larger staff involvement in the projects. To compliment the increase in time committed to practical sessions, it was suggested that the material covered during the course be scaled back.

The IT support during the course, although adequate, could be improved. In particular, it was suggested that two IT support staff should share the workload each day, with one person being available for the morning sessions and another being available for the afternoon.

The amount of work associated with printing, organizing and binding the course material was stated to be excessively time consuming. The support staff recommended that either this task is outsourced in the future, or the amount of printed material be decreased and alternative methods such as storing documents on pen drives be used.

Further recommendations included getting Mailman School of Public Health more involved in the Summer Institute, and removing lunchtime seminars from the course schedule. In addition, clearer guidelines need to be provided to the facilitators regarding the setting of quiz questions. In particular, it may be suitable to use a multiple choice quiz format only in the future.

We shall leave the concluding words to the trainees themselves:

"All the speakers were great!"

"It was very good and interactive"

"I have gained amazing knowledge and skill in the use of climate information in public health practice"

"The hands-on experience we got in the practical sessions exceeded my expectations"

"The practical sessions are the backbone of the course"

"This training gave me lots of ideas on how to run training in my own institute"

"I have met people from different countries and disciplines.The interactions were fruitful and I hope to use these contacts for more collaboration"

"The course for the training was carefully designed and well planned"

"Exposure to the Data Library with hands-on experience and availability of internationally renowned expertise in all aspects of climate and health at the Summer Institute is the uniqueness of the course"

"The faculty, facilitators and organizers of the course deserve commendation"

Recommendations

Application Process

Despite the successes of the Summer Institute in rapidly increasing application rates (up 212% since just last year – from 43 in 2009 to 134 in 2010) and attracting well-qualified applicants, the information in the applicants report also sheds light on a number ways in which improvements may be made surrounding the Summer Institute recruitment process.

With many applicants learning about the Summer Institute via IRI Communications, including CIPHA Newsletters and Summer Institute promotional emails, it would be wise to continue actively expanding the CIPHA Contacts Database. This can be accomplished through a number of activities including network building with members of IRI and IRI affiliates and collaborators, as well as (again) through social media. Linked to such network building and, additionally, building upon word-of-mouth promotion, it is suggested that there be increased efforts aimed at collaborating with, and marketing towards, universities.

It is clear that demand for the Summer Institute workshop far exceeds the limits of face-to-face training that can be effectively supplied by the IRI. There is therefore a need for the rapid development of an online learning network that can educate those applicants who are either not accepted into the Summer Institute or who are otherwise incapable of participating due to such limitations as financing their trip or taking two full weeks away from their work responsibilities. The expansion of this website could also prove a successful new tool for Summer Institute marketing and recruitment efforts

Evaluation Process

It was clear that there was some dissatisfaction with the balance between lectures and practical sessions. There were a number of comments from those involved in organizing the course suggesting that perhaps too much material was being covered, and would be improved by scaling back on the content of the course, and increasing the amount of time available to work on the practical aspects.

Further recommendation in relation to the projects were that there be a greater staff involvement in the projects, hence providing a greater amount of guidance to the trainees regarding what was expected of them. Further, some of the trainees suggested that further information be provided to trainees prior to the start of the course regarding what kind of data would be suitable for their projects.

With respect to the addition of the daily quiz and review session, both were very well received and generally well answered by the trainees, although there were comments that not enough time was available to complete these tasks. In order to overcome this issue, it's recommended that the quiz questions be limited to multiple-choice questions in order to reduce the amount of time required to answer then. Further, it may be beneficial to extend the session slightly.

Lunchtime seminars were not well received as trainees felt that these sessions were not given their due attention as the course itself is so intensive. Trainees believed that lunchtime would be better spent taking a proper break.

The support staff expressed some concern regarding the amount of work involved in preparing the printed course material for SI 10. As this was a very time consuming task it was suggested that this task be outsourced. Alternatively, the amount of printed material provided to trainees could be reduced by storing some of the non-essential material on a pen drive.

It was also suggested that the number of IT support staff available was inadequate. During SI 10, one member of staff was responsible for the IT support for the whole course. It was recommended that this be increased to two in future years, and each staff member would either be responsible for the morning or afternoon sessions.

A final recommendation made by the course organizers is that Mailman School of Public Health increases their involvement in the course.

Appendixes to this document are available from a separate link.